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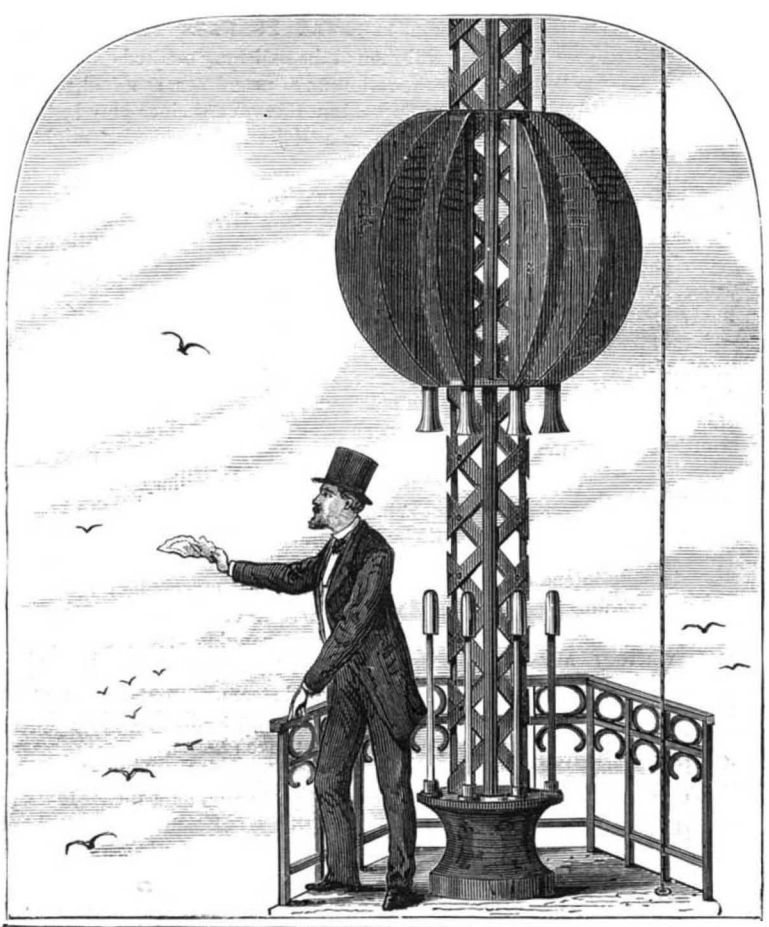

ELECTRIC TIME SERVICE FOR NEW YORK.

What's the hour? In these words the time query was anciently put; and the answer named the hour, never the minute. Exact time recorders were unknown to the multitude; time was estimated rather than measured; and anything within the hour was practically close enough. The almost disused proverb, "It's always ten until it's eleven," remains to tell of the carelessness of our great-grandfathers in this respect.

Washington's reply to his secretary, who had delayed an important meeting half an hour and tried to excuse himself by saying that his watch had lost half an hour, "You will have to get a new watch, or I a new secretary," shows that the day of the proverb was then well past. Had the watch been only a quarter slow, the excuse would probably have been accepted.

With the increasing perfection of timepieces and the extension of the custom of carrying watches, the limit of tolerable variation was soon reduced to five minutes, or even less; yet the time is within the recollection of most men when, were a man to give the odd minute in response to the question "What is the time?" he would be laughed at as a prig who wanted to show off his watch as something uncommonly fine. Now it is no unusual thing to hear men name the nearest second, and qualify the remark by saying that their watch is two or three seconds fast or slow by the time ball or some other popular standard. Away from our commercial manufacturing centers so great a refinement of time measurement may seem to be needlessly nice. What odds can a minute more or less make any way to an easy going farmer or laborer? The odds may be very small indeed, but the traveler does not think so when he misses an important train by being a minute late, nor the merchant whose notes go to protest because his messenger is that much behind time. Where large and complicated affairs are being carried on, as in railway management, the time element becomes vitally important; and in this connection the railways of the country have been a powerful means of popular education.

It was from the necessities of railway management, indeed, that the electric time service grew up. The safety of life and property demanded that the servants of each road should not only have trustworthy timepieces, but that they should all be regulated by some common standard. The history of the development of the electric time service for railway purposes, however, does not fall within the scope of this article, though it would be well worth recording: our purpose is rather to describe and illustrate the special application of the service to this city.

Allusion has been made to the time ball. Many of our distant readers may not know that the standard time of this

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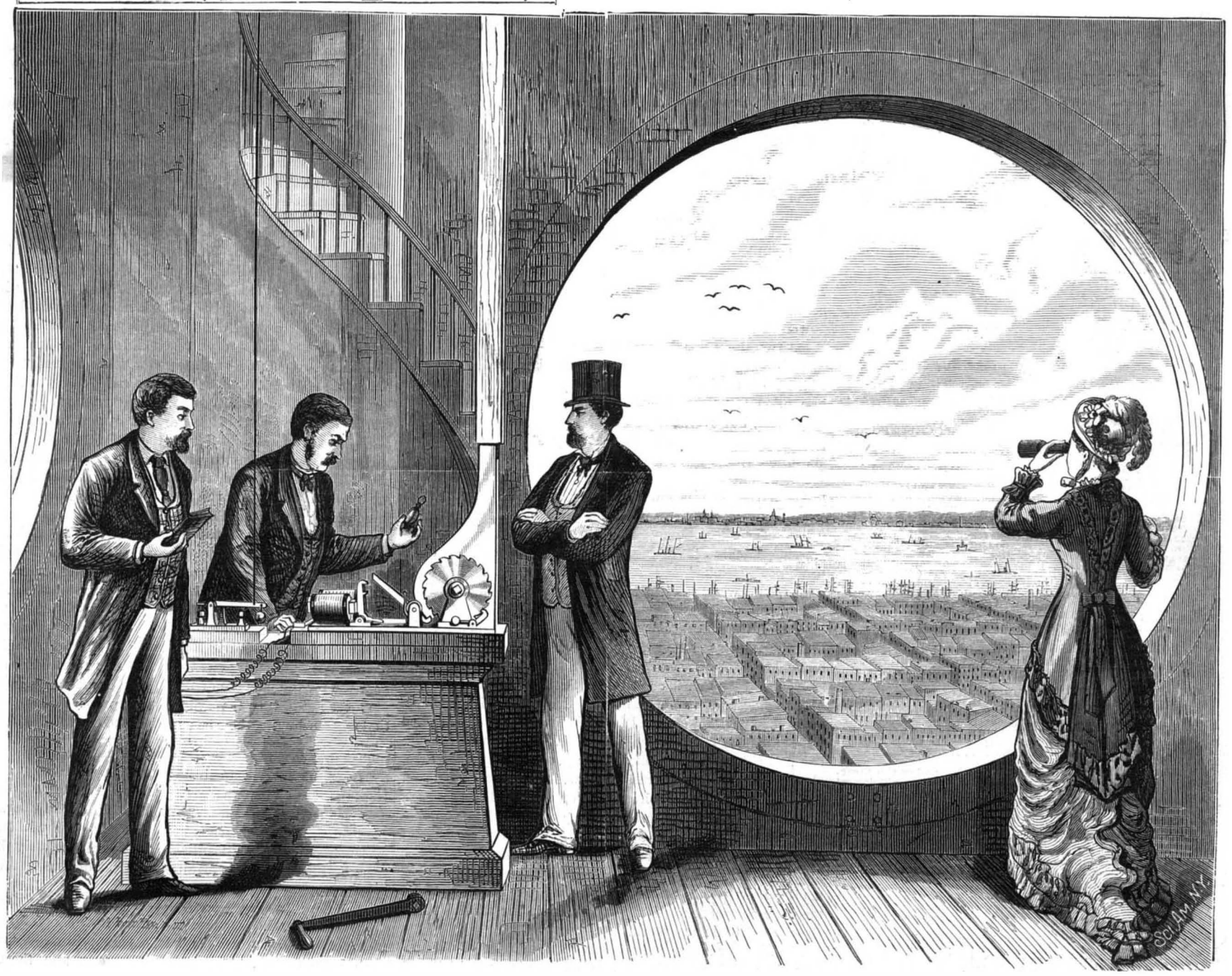

THE ELECTRIC TIME BALL.

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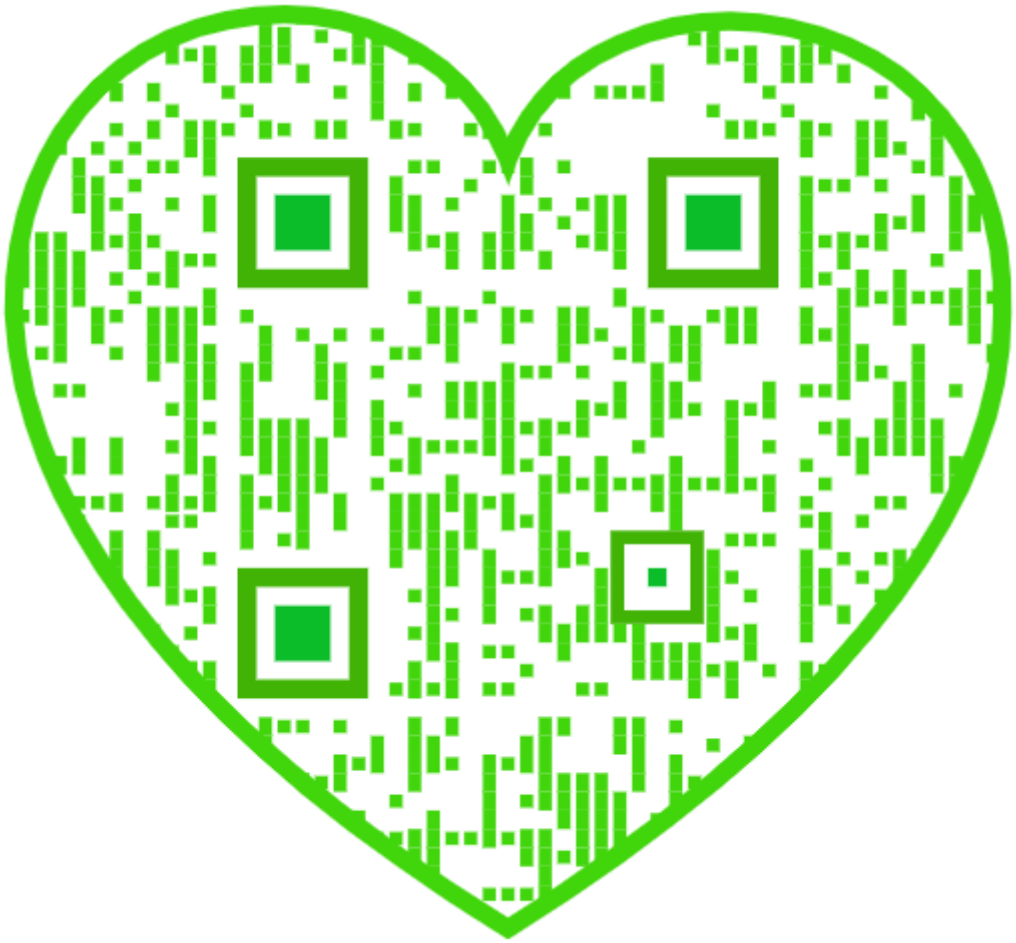

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NEW YORK, SATURDAY, NOVEMBER 30, 1878.

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THE HOSMER MOTOR.

The daily press is just now considerably exercised about an alleged new magnetic motor, said to have been invented by Miss Harriet Hosmer, the artist, and claimed by Mr. J. Linton Chapman, Dr. O. H. Needham, and there's no telling how many others, as their own individual invention. From one point of view the energy of the rival claimants is irresistibly funny, seeing that no understandable description of Miss Hosmer's alleged invention has yet been made public. From another point of view the rival claims are not at all surprising, inasmuch as multitudes of beginners in electrical science appear to be working on the same problem which report says Miss Hosmer has solved: namely, to make a machine which will run itself chiefly or wholly through the agency of a permanent magnet. This office is almost daily in receipt of letters from such inexperienced experimenters asking what substance can be used to neutralize the force of a permanent magnet: that given, their new motor, they say, will be a perfect success, and the biggest thing out. We have, unhappily, been unable to furnish the needed information.

Mr. Chapman, who is quite sure that Miss Hosmer will not claim the discovery as her own, says until his patents are secured, he must decline to say just what the invention is. Yet he claims to have discovered "a new, unknown, perfectly novel force, generated by a permanent magnet, which can be used as a motor." And, again, he says: "My invention is a motor, not a machine requiring force to propel it. It generates force."

The history of the search for perpetual motion by self-motive power is full of just such discoveries and inventions; and Mr. Chapman is by no means the first to solve the problem by means of a permanent magnet, to the inventor's own temporary satisfaction, and the astonishment of the inexperienced.

In justice to Miss Hosmer, however, we must say that we do not believe that she is engaged in quite so foolish a search, though she appears to have been so indiscreet as to employ Mr. Chapman as her agent to go to London to superintend the construction of her machine. Her claim, according to the correspondent of the *Evening Post*, is the discovery of a new application of a permanent magnet, whereby any amount of power can be secured at a small cost. Mr. J. A. C. Gray, of this city, recently from Rome, where Miss Hosmer's experiments were carried on, has given to a reporter a letter from Miss Hosmer, which gives a clew to the probable nature of her invention. Speaking of her motor, Miss Hosmer says:

"All doubt about its working, my dear friend, is, I believe, absolutely at an end. Mr. Chapman says, in a letter received three days since: 'It goes. I have seen it go with my two eyes. And if it only moves, it is sufficient to prove the efficiency of the principle; but it more than moves, and we can put on as much force as we like.' He says: 'We can get great force in a small space, and there is no limit to the layers of —— and —— we can attach when we want power.' The blanks you know how to fill up. I do not venture to put the names upon paper."

The "layers of —— and ——" clearly indicate a battery of some sort, which removes the invention from the disreputable category of perpetual motors generating their own force. It does not follow, however, that the invention is to sustain the extravagant claims made with regard to it. The fact that it goes is no proof of its efficiency, nor of its novelty, as will be shown further on.

Another gentleman who pretends to know all about it, Mr. T. C. Clarke, of Philadelphia, says that "it is not a perpetual motion, but it dispenses with batteries, and draws its power directly from that great magnet called the earth." What function the "layers of —— and ——" fulfill, in this case, does not appear. That the natural magnetic currents of the earth can be drawn upon sufficiently to keep a machine in motion is not at all improbable; in view of their great feebleness, however, the probability of getting any excess of power for economical work that way does not seem to be alarming.

The first account of Miss Hosmer's invention gave the impression that it was self-containing. If this be true, the "layers of —— and ——," in all probability, form what is called a dry pile. Some years ago, a very clever little self-running machine involving this principle was exhibited at a prominent optician's in this city. The pile was adroitly concealed, and was sufficient to keep the machine moving for a long time.

One of the most successful dry piles is Zamboni's. In this the electro-motors are tin or silver and binoxide of manganese. A piece of paper is tinned or silvered on one side, and the other is coated with finely powdered binoxide of manganese, by rubbing the powder on the slightly moistened paper with a cork. Disks of this paper are then piled up, so that the metal of each disk is in contact with the binoxide of the next. The pile is then pressed into a glass tube, closed at both ends by brass caps, which serve as poles. In a pile containing some hundreds or thousands of couples, the electric tension is considerable; and though the current may be strong enough to operate a machine deriving most of its power from permanent magnets, the energy available would be neither great nor economical. The action of such a pile, however, is remarkable for its permanence, and a machine so constructed might run itself for several years, though not to do any work.

The Hosmer motor may involve some device of this nature, in which case the fact of its running would be no proof of its utility. It is possible, on the other hand, from Mr. Clarke's assertion, that some form of the well known earth battery is employed, and a delusive voltaic current obtained and mistaken for the earth's natural magnetic currents. Quite a number of applications of the earth battery, running back as far as 1838, were described in the SCIENTIFIC AMERICAN, January 30, 1875. A plate of zinc and one of copper, or a bag of coke, buried a little apart in moist earth, have been used to furnish the current for electric clocks. The sole merit of the arrangement of such a battery lies in its being out of the way and requiring no attention. An ordinary small cell will do much work. An improved earth battery, consisting of a series of elements buried in the earth and connected together, and claimed to give intensity of current as well as quantity, was patented by a Brooklyn man in 1874.

THE SALISBURY FURNACE FOR PETROLEUM.

The exhibition of the Salisbury method of using petroleum, or rather the residuum of petroleum, as a fuel, which has been held at the Brooklyn Navy Yard since May last, was varied a few days ago by a trial which resulted as might have been anticipated.

After months of work, which developed the inefficiencies of the apparatus and process, and after a wide circulation of the most extravagant claims on the part of the exhibitor, an application of his process was made to one of the boilers of the machine shop of the marine pattern.

After the fire box was well heated with coal, petroleum residuum was injected into it by a jet of hot steam; the residuum, supplied from an elevated tank, was liquefied by the heat from a coil of steam pipe placed therein; the injecting steam was superheated by passing through a coil of pipe laid in the fire box of another boiler; the air used to assist in combustion was forced, by an auxiliary jet of steam, through a section of six inch pipe arranged in the fire box of the experimental boiler, and the coal fire throughout the trial was kept up with the expenditure of about 250 lbs. of coal.

It is estimated that for each pound of residuum burned an average of about 9 lbs. of water was evaporated from 212° Fah., the amount ranging from 8 lbs. or less to about 12 lbs., and this with all the help given by the coal, hot air, and superheated steam. So defective and unsatisfactory were the apparatus, method, and results that the trial was continued but seven hours.

This six months of work, then, has determined nothing respecting the merits of petroleum as a fuel. It was called a petroleum process, but no petroleum was used; chemical and calorific effects were claimed for it which are not possible or even desirable to any process. It was promised by the operator to remove forever the obstacles and make pleasant the ways of the iron and glass manufacturers, the steamship owners, the petroleum producers, the gas consumers, and all others troubled by the quality or cost of coal or gas.

A more efficient method of bringing disrepute upon legitimate petroleum processes could hardly have been devised, and so great is the difference between the promise and performance that one is at a loss to determine whether the whole work should be ascribed to blundering ignorance or careful intent. The manipulations and the results permit of either interpretation.

Danger from Lubricating Oils.

From a paper read by Professor John T. Ordway, at a recent meeting of the New England Cotton Manufacturers Association, it appears that many of the oils used for lubricating machinery may be classed as dangerous, because when heated to a sufficient degree they throw off an inflammable vapor. In this respect it is claimed that some of the animal and vegetable oils are even more hazardous than those which are partially mixed with earth oils, and that the higher price of an oil is by no means a guarantee of its safety. An account was given of a fire last summer in the Bates Mills, Lewiston, Me., at which the flames, on reaching the weaving room, shot across it in all directions on a level of about five feet from the floor, and with sufficient heat to melt the lead connections to a gas meter located on the same plane of height—from which the gas had fortunately been shut off—while a towel hanging two feet below this level was not so much as scorched. This was thought to show that there was a body of inflammable vapor hanging in the air, cast off by the oil used on the machinery. Apart from the danger of fire, the transformation of oil into vapor is a waste of material which every manufacturer would gladly prevent, and it will therefore be of interest to all who have to use lubricating oils to know that experiments are to be made for the purpose of finding out some ready and simple means of testing the evaporating properties of oils, so that any one buying them can quickly judge of their qualities.

THE first cargo (of wheat) this summer has been brought by sea from Siberia to Hamburg on a Danish vessel, the Neptune. She made the voyage from Hammerfest, on the northern coast of Norway, to the mouth of the Ob, where she loaded, and back again in five weeks, and without experiencing any great difficulties, by following closely the instructions given by Prof. Nordenskjold, from his first Arctic expedition.

NO FAMILY who can possibly afford it should fail to have upon their table two of the best papers printed in the English language—the SCIENTIFIC AMERICAN and the *Christian Union.*—*Janesville (O.) Recorder.*

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PATENTS FOR PROTECTING THE DEAD.

In consequence of the increasing number of graveyard desecrations, the genius of the inventor has been incited to devise means for their defeat. Among the most recent patents is one for a coffin torpedo, which consists of a canister containing powder, balls, and a firing trigger, so arranged, that on placing the torpedo within the coffin, and finally closing the lid, should any attempt be made to open the coffin, the torpedo will be instantly exploded, a noise like thunder ensue, and deadly balls will fly in all directions. Had the remains of the late millionaire, Mr. Stewart, been protected by means of this invention, the neighborhood in that part of our city where his body rested would have been alarmed, while the robbers themselves would doubtless have suffered sudden death as the penalty of their rash and sacrilegious attempt.

THE OFFICIAL REPORTS OF THE PARIS EXHIBITION.

The general report of the Paris Exhibition will be made by Assistant Commissioner General F. A. P. Barnard, President of Columbia College. Dr. Barnard proposes to depart from the usual custom of making a voluminous catalogue of all the articles on exhibit and making more or less superficial comments on each class. Instead he will view the Exhibition chiefly from the standpoint of a political economist as to the evidences it furnishes in its exhibits of the gradual but certain substitution of machine work for hand work, and the social and political effect of this as shown by statistics carefully gathered from the best sources in all countries. In the collection of these statistics he has met with the cordial assistance of the largest manufacturers of Great Britain and Continental Europe. Special reports are to be made by each of the nine commissioners in charge of the nine groups into which the American section was divided. These commissioners are expected to embrace in their report all the classes in the respective groups under their control. These reports, Dr. Barnard says, in the very nature of things must be incomplete and unsatisfactory, owing to the fact that the group of classes embraces industries of so miscellaneous a character that it would be hard to find any one man capable of making a detailed report upon each. For instance, under the head of education and science are grouped education in its primary and higher branches, medicine, surgery, printing, books, instruments of precision, asylums, schools, colleges, prisons, and a multiplicity of other things which no one man is likely to possess a sufficiently intimate knowledge of scientifically and exhaustively to report upon them. As in this group so it is in all the others.

SKILLED LABOR IN NEW YORK CITY.

In order to discover the real condition of the labor market of this city, the *Daily Bulletin* has thoroughly canvassed the leading industries of the city, and in its issue of October 24 it published in detail the result of its inquiries. The grand results are shown in the table below, in comparison with the corresponding statistics for the fall of 1873, just preceding the great financial and industrial collapse:

	Hands Employed.		Wages.	
	Oct. 1878.	Oct. 1873	October. 1878.	October. 1873.
Printers and electrotypers ..	207	183	$9 50	$10 50
Printers and bookbinders.....	406	300	10 00	12 00
Job printers.....	—	—	16 00	20 00
Tobacco manufacturers.....	2,060	1,925	6 30	8 50
Book publishers	1,300	1,300	7 to 12 per c. lower	—
Stationers.....	275	275	14 00	20 00
Cabinet makers	450	305	13 00 to 15 00	18 00 to 21 00
Billiard table manufacturers..	100	100	15 00	22 50
Carvers (Eureka Company)...	10	40	15 00 to 18 00	35 00
Card manufacturers.....	150	300	7 00	7 50
Pianoforte manufacturers....	850	700	14 00	18 00
Sewing machine manufs.....	1,000	800	18 00	18 00
Soap manufacturers.....	150	150	9 50 to 10 00	12 00 to 15 00
Plumbers.	14	14	15 00	15 00
Hydraulic works.....	350	100	13 50	15 00
Steam engine works.....	160	125	12 00	15 00
Paint manufacturers	80	66	9 00	12 50
Jewelers	75	55	12 00	14 50
Sugar refineries.....	1,100	850	8 50	11 00
Silversmiths.....	90	90	24 00	30 00
Iron manufacturers (about)...	50	300	16 00	16 00
	8,877	7,578	$13 00	$19 20

While this table is not offered as an exhaustive statement of the industrial condition of the city, it at least affords a fair presumption that the demand for skilled labor in this city is quite as good as it was in the flush times before the panic. So far as the inquiries went, there had been an increase of 17½ per cent in the number employed. On the other hand, the average decline in wages was nearly one third; that is, nominally. It is to be doubted whether three dollars would have purchased more in 1873 than two dollars will now.

THE COST OF INSECURITY.

The great robbery of the Manhattan Savings Bank has incited a *Herald* writer to look up the more notable burglaries of the past fifteen years. The list embraces some seventy-five or more banking institutions that have suffered in this way, the aggregate loss footing up about $15,000,000. Thus it appears that in this country alone, in one class of robberies, an average loss of a million dollars a year has been sustained. A single year's burglar tax would probably supply time locks and electric alarms to every bank vault in the land.

Electric Light Patents.

The revenue of the English Patent Office is being greatly increased by the number of applications for appliances in connection with the electric light. It is said that as many as two or three applications are filed every day, and that the inventive genius of the Old World has never been so active as at the present time.

ELECTRIC TIME SERVICE FOR NEW YORK.

[*Continued from first page.*)

city has for some months been determined by the dropping of a ball above the Western Union Telegraph building, at the corner of Broadway and Dey street, precisely at noon each day; and few of those who daily avail themselves of the means thus afforded for regulating their timepieces understand the mechanism by which the ball is dropped at the right moment by an operator seated in the National Observatory at Washington, two hundred and forty miles away.

The upper portion of Fig. 1, front page, shows the time ball raised a little above the supports on which it is received when it falls, and also the structure of the iron pole on which the ball slides. The plan of the ball is shown in Fig. 2. Though from a distance the ball appears to be solid, it is in reality composed of a dozen thin vanes of sheet copper disposed radially, half of them semicircles, the rest crescents. By this device the visual effect of a solid ball is secured with the least possible resistance to the wind, or to the air when falling. The man in the figure stands 287 feet above the street, and the ball rises 28 feet higher. The ball falls 23 feet, and is received by the six plungers already mentioned, which enter the closed cylinders attached to the ball, providing as many air cushions for the arrest of the motion of the ball without the shock. The moment the ball begins its downward course is noon.

The operating of the ball is a matter easily explained. Five minutes before noon the officer in charge of the station climbs to the room shown in the lower part of Fig. 1, and raises the ball nearly to the top of the pole. This is done by means of a drum fixed at the right hand end of the table; the cord from the drum passing upward through a box to the foot of the tower, thence through the air to the top of the pole, where it passes over a pulley and is attached to the ball. Two minutes before noon a signal is received from Washington that all is ready, whereupon the ball is raised to the top of the pole, and the crank removed. The ball is now held in position by means of the lever shown in the cut, one end of which engages the ratchet wheel of the drum, the other being caught in the notch in the little standard to the left. The latter is attached to the armature of an electro-magnet, which is placed in telegraphic connection with the National Observatory at Washington. At the moment of noon, New York time, the officer in charge at Washington closes the circuit; the armature is retracted, the lever disengaged, and the ball drops. The instant the ball reaches the base of the pole the fact is automatically reported at Washington through the electric tell tale shown at the left end of the table, Fig. 1. Owing to the great height of the ball when raised, it is visible for many miles around; and directly or indirectly the clocks and watches of some two millions of people are thereby kept from straying far from the true time. Even as far off as Bayonne, N. J., according to a local paper, the principal of a public school regulates his clock daily by the falling ball. The ball and its discharging apparatus were designed by Mr. George M. Phelps, Superintendent of the Western Union manufactory. The public service thus rendered by the Western Union Telegraph Company is wholly gratuitous, and affords not only a notable illustration of the public spirit of our great commercial corporations, but also an illustration of the far-reaching indirect benefits which applied science is constantly conferring upon modern life, free of expense to the recipients.

Fig. 2.

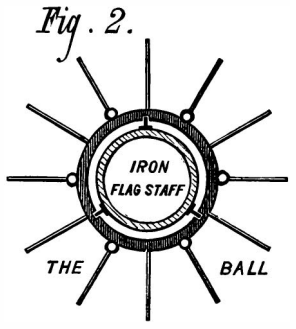


Fig. 3.

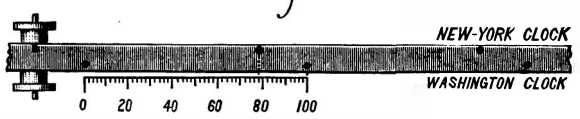
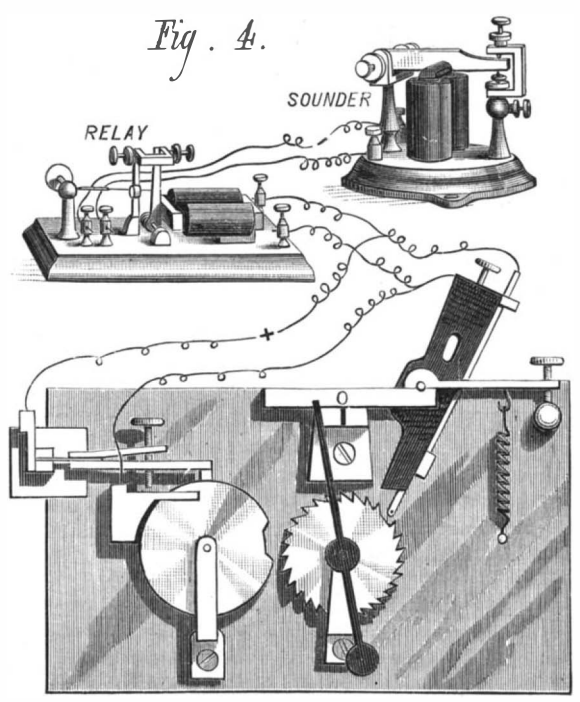


Fig. 4.



But the time service does not end here. To reap the full benefit of the time ball, a great number of people must watch for its fall; that takes time, and time is money. It is cheaper to employ one man with a little machinery to regulate the time of all, and the service is much more surely attended to. Accordingly Mr. J. Hamblet has introduced a system of constant time service, by which our clocks may be kept constantly under the electrical control of a central regulator or standard clock, which is kept in exact time with the clock of the National Observatory, due allowance being made of course for the difference in geographical position.

The central regulator is stationed in the Western Union Telegraph Company's Building, and is so constructed as to keep time with the highest attainable accuracy. In addition, it is every day compared with the clock of the National Observatory at Washington, and checked by the daily time observations made at the observatories at Allegheny, Pa., and Cambridge, Mass., with which it is in telegraphic connection. By this it must not be inferred that the clock in question is kept in exact accord with either or all of the observatory clocks, that being a mechanical impossibility. The range of variation, however, is kept within a few hundredths of a second.

The reader must not be incredulous; it is possible to measure, nay more, to record, the hundredth part of a second. Fig. 3 will make clear how it is done. It shows a section of the paper tape of the chronograph, which is used in comparing the standard clock with the clock of the Washington Observatory. The chronograph is electrically connected with both clocks, and records the pendulum beats of each on the strip of paper. If the beats are exactly synchronous the dots stand side by side. If the beats are not synchronous the dots will be separated by an interval, long or short, according to the difference of the clocks—that is, the difference in time between the beginnings of corresponding beats —and the speed of the chronograph. Supposing the clock to be beating seconds, and the chronograph to discharge an inch of tape each second, it is obvious that the dots recording the beats of each clock will stand one inch apart. It is obvious, too, that the lineal space between the recording dots of two clocks not beating exactly together, can easily be measured, as shown by the scale placed below the dots in the cut (Fig. 3), and thereby the difference in time exactly determined.

The next step in the time service is to distribute the accurate time thus maintained to such as want it, which is done through an electrical attachment to the standard clock. This controlling clock was constructed by E. Howard & Co., of Boston, from designs by Mr. Hamblet, and has a Dennison gravity escapement. The front clock plate and the electrical mechanism are shown in Fig. 4. The wheel in the center with the second hand revolves once a minute. One of its thirty teeth has been filed away, the vacant space causing the omission of the tick which would otherwise mark the fifty-eighth second of the minute. The remaining teeth act upon a delicate jeweled spring, which breaks an electric circuit at the passage of each tooth. The two wires connecting with this spring and its banking operate the relay, at the left of the figure, and through it the sounder, which indicates the beginning of each minute by a pause of two seconds. The beginning of each five minutes is identified by a pause of twenty seconds, obtained through the agency of the five minute wheel to the left of the seconds wheel. At each revolution of the five minute wheel the lever at the top drops into the notch in the wheel, making electric connection between the two wires governing the relay, thus preventing the minute wheel from breaking the circuit for the space of twenty seconds. At the right near the top of the figure is shown a sounder, which may be located at any point on the lines. It is by means of these sounders, with which the recipients of the service are supplied, that their timepieces are regulated.

The practical advantages of this constant and trustworthy time service will appear to any one who has to do with important commercial or industrial affairs. One of the great sources of friction in social and business intercourse is time variation and uncertainty. The maintenance of a common and authoritative standard will go far to lessen such friction, to the great time saving of all classes, and the prevention of many mistakes and misunderstandings. Where thousands are engaged, delays of no more than a minute at a time amount in practical effect to the loss of hours, days, even months of individual labor. In a factory employing only three hundred men, a variation of one minute in the signal for starting and stopping means the loss of one man's work for a whole day.

The immediate direction of the New York Time Service is in the hands of Mr. Hamblet, Room 40, Western Union Telegraph Building. The business generally is controlled by the Gold and Stock Telegraph Company.

Left Handedness.

At the late meeting of the British Association, Dr. H. Muirhead made a communication on "left handedness." He thought it depended upon which half of the brain took the lead. Left handedness once begun in a family was likely to run in it. It was a curious fact that left handed people had the left foot one third to one eighth of an inch longer than the right.—*Med. and Surg. Rep.*

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The Testing of Boiler Iron.

A number of Eastern boiler plate manufacturers, with the manufacturers of this and other States, lately met at the Continental Hotel, Philadelphia, to reconcile the differences of opinion existing between them and the officers of the Steamboat Inspection Service, and to decide upon some satisfactory method of testing the qualities of boiler iron. The result of the meeting was the adoption of the following:

Resolved, That, in the judgment of this meeting, plates which show a contraction of area of less than 12 per cent shall not be used in a steamboat boiler. We therefore recommend that all boiler plate stamped with a tensile strain of under 45,000 lbs. should show a contraction of area of 12 per cent; 45,000 lbs. and under 50,000, should show 15 per cent; 50,000 lbs. and under 55,000, 25 per cent; 55,000 lbs. tensile strength and over should show 35 per cent.

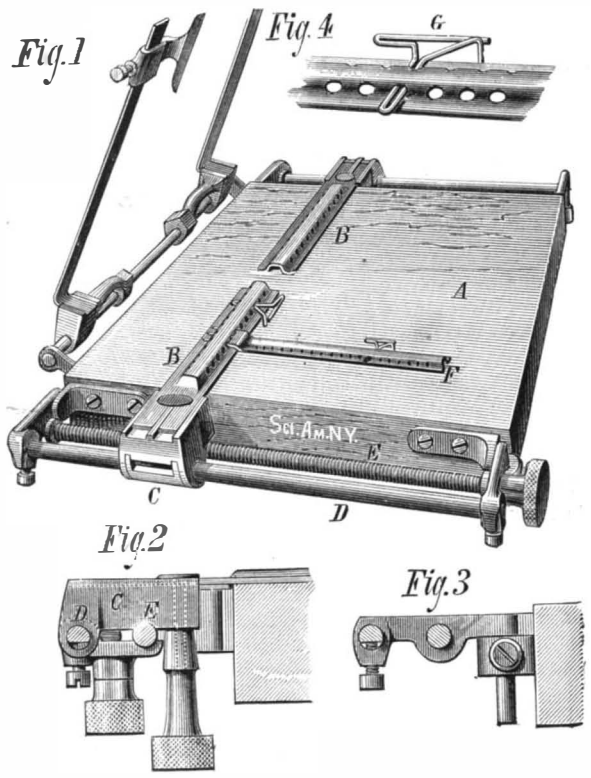
Whereas, The question was raised before the meeting of the Board of Supervising Inspectors at a meeting last January, in regard to the form of test piece that they had adopted; and

Whereas, The Board, in order to meet the views of the manufacturers, adopted two modes of preparing the test piece, with a view to ascertain which was right; therefore

Resolved, That the thanks of this meeting be extended to the Board for that act of courtesy which has resulted in the fact that there is no practical difference in showing the two modes, and that we respectfully suggest to the Secretary of the Treasury that test pieces cut from the plate to be used in steamboat boilers should all be tested at some central location by a person appointed by the Secretary of the Treasury, to be under the direction of the Supervising Inspector General of Steamboats.

A NEW PLATEN GAUGE.

The accompanying engraving shows, in perspective and in detail, a novel gauge applied to the platen of a printing press for holding and guiding the paper that is printed upon. The platen, A, is of the usual form, and has upon



HALLECK'S PLATEN GAUGE.

one of its edges a shaft carrying the usual grippers. Adjustable finger bars, B, are clamped by their slotted ends to split nuts, C, that slide on the rods, D, and are moved by the screws, E, which, together with the rods, D, are supported by removable brackets (Fig. 3) at the sides of the platen. The split nut, C, is capable of being tightened by means of the nutted screw, as clearly shown in Fig. 2. When the finger bars, B, are attached to the adjusting nuts, C, they extend along the face of the platen parallel to its longer sides. The finger bar has a raised middle portion, having a series of side perforations for receiving the shanks of the side and end gauges, and also the supplementary finger, F, which is also designed for receiving the gauge pins. The finger bars may be instantly removed when it is desired to clear the platen for a fresh blanket.

The gauge pins, G, are made of wire in the form shown in Fig. 4, and they are readily inserted into or removed from the fingers. They form a reliable guide for the edges of the paper, and facilitate the adjustment of the press, while pin holes in the blanket are avoided.

This improvement was recently patented by Mr. Samuel P. Halleck, of Oriskany, N. Y., from whom further information may be obtained.

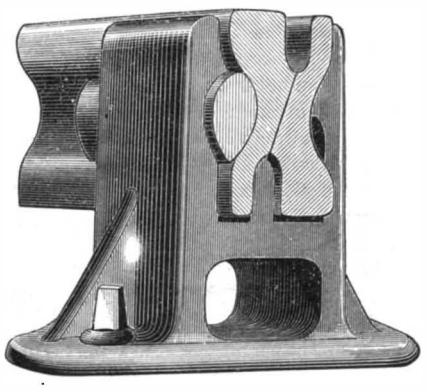
Polarized Light.

A correspondent of the Philadelphia *Public Ledger* calls attention to the circumstance that an extensive exhibition of polarized light is to be seen twice a week in the International Exhibition Building in that city.

When the electric lamps are in action on Wednesday and Saturday evenings, the light, passing obliquely, at an angle of about 56°, through the thick glass of the show cases (the plates stand at right angles), instead of throwing a faint shadow on the floor, as might have been expected, forms an exquisite appearance of irregular, bright, oval lines, like large lacework, surrounding spaces softly blended in shadow. This accidental exhibition is, to many persons, alone worth the fee to those evening entertainments.

TRAMWAY RAIL EXPERIMENTS.

Tramways are now becoming a subject of great interest to the engineering world and the general public. Improvements in detail are still being continually made; but much



remains to be accomplished, and in no direction can more effectual improvement be introduced than in the road and rails. Upon the durability and freedom from repairs of the road depends very much the financial success of the tramway. We may all easily understand the time and money constantly being expended in our streets in taking up large stretches of the roadway to relay tram rails. To minimize this outlay two objects should be kept in view in the construction of the road. In the first place the rails and road should be solidly constructed, and supported so as to offer the best resistance to wear and tear; and, secondly, the rails and attachments should be made so as to offer the greatest facility for removal of the rail without disturbing the roadway. Messrs. Aldred and Spielmann have introduced a split rail and chair. The running over this compound rail is most smooth, and puts an end effectually to many complaints which travelers in tramcars, railway trains, omnibuses, and even cabs are often ventilating. We may, with advantage, give a synoptical outline of the system here.

The rail is a compound split one, formed from two similar duplicate halves reversed to one another. So that the broad head of one is uppermost, while the narrow head of the other half forms a guard to the broad tread. The two halves of the rail meet one another on an inclined surface, so that the downward pressure on the one half is received and resisted by the other half. When one half is worn out, the rails can be reversed, and the worn half turned down and used for a guard. The split diameter of the rail enables the joint to be made only in one half at a time, so that in no place is the rail wholly broken and dependent only on fish plates for its continuity. The rail has the joint broken only in one half in one place, and always in a chair, the rails overlapping, and thus always forming a continuous and well supported line. The joint in the chair is secured by a wedge or key in the hollow chest of the rail, thus making everything secure at the joint, and entirely dispensing with fish plates and through bolts and punching of rails. This makes the road and metals very cheap, so that a much heavier and stronger road can be made for the same money than the light and flimsy patterns in use. The inventors have sample lengths of line giving great satisfaction in other parts of London and Great Britain, and are now carrying out some large orders. This rail seems to supply a want in tramway roads, and is now being adopted so freely as to in-

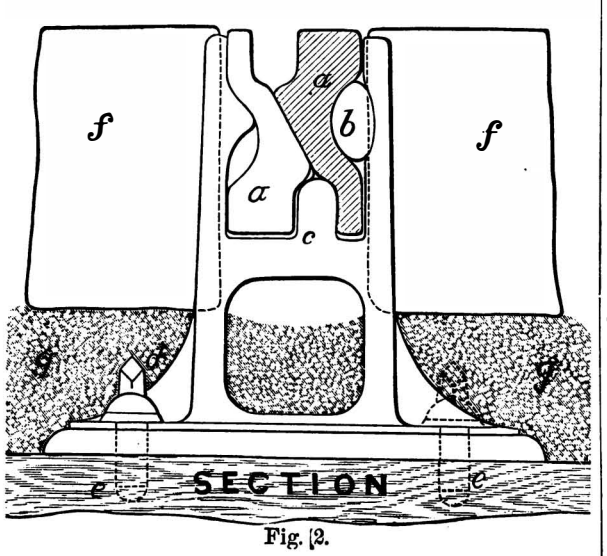


Fig. 2.

duce the belief that the owners of tramways recognize in it a remunerative successor to the old rail.

Gas and Water Tight Cloth.

Dr. Hirzel, of Leipsic, has recently patented in Germany gas and water tight cloth, which he makes, according to the *Manufacturer and Builder*, by placing a large, smooth piece of so-called gutta percha paper between two pieces of a not too coarse and dense material, for example, shirting (undressed), and then passing the arrangement between heated rollers. The outer pieces of shirting combine in the most intimate way with the inclosed gutta percha to form a material which is impenetrable by gas and water. It may be made still denser and more resistant by being coated on both sides with copal lac. The substance is conveniently flexible, and will remain proof against variable influences of weather and external temperature. It can be applied to all those purposes for which waterproof material is used, and it is well adapted to form gas tight membranes for regulators of pressure of compressed gas, bags or sacks for dry gas meters, and also dry gas reservoirs.

The objection, however, is that gutta percha is an unstable substance, which cannot resist the ordinary atmospheric influences for more than a few years, during which time a gradual oxidation makes it at last hard, brittle, porous, and finally utterly worthless. India rubber is better in this respect, as it lasts longer, but this also gives out at last.

[If the above invention is applicable for gas tubes, or if any one can invent a flexible tube for conveying gas which will prevent the latter from extruding through the pores after short use, it would be very desirable.—ED.]

American Society of Civil Engineers.

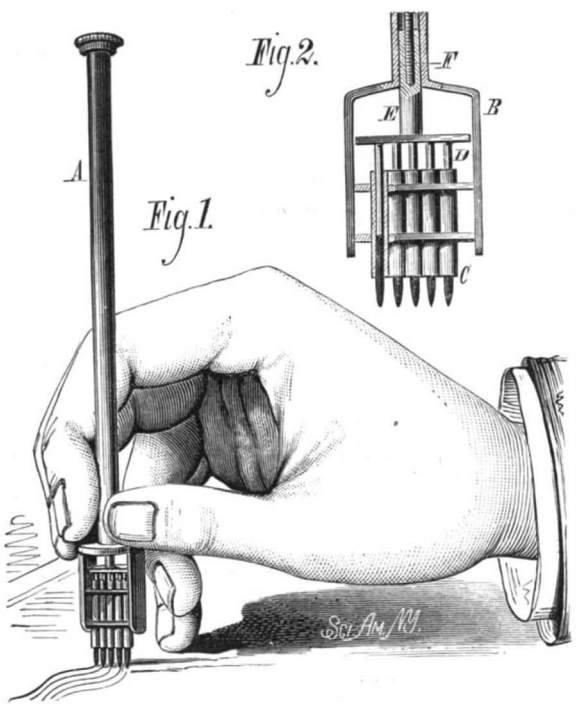
At the recent annual meeting, New York, the following persons were elected officers of the American Society of Civil Engineers for the year beginning November 6th, 1878:

President, W. Milnor Roberts, Vice Presidents, Albert Fink, James B. Francis; Secretary, John Bogart; Treasurer, J. J. R. Croes; Directors, George S. Greene, William H. Paine, C. Vandervoort Smith, Thomas C. Clarke, Theodore G. Ellis.

A NEW DRAUGHTING PENCIL.

The accompanying engraving shows in perspective in Fig. 1, and in section in Fig. 2, a novel draughting pencil, recently patented by Mr. F. W. McGee, of Rutherford, N. J.

It is especially designed for drawing parallel lines to represent the coast or shore in map drawings; but it is applicable to various other purposes.



McGEE'S DRAUGHTING PENCIL.

Its construction will be clearly understood by reference to Fig. 2. A is a tube, having at its lower end a fork, B, which supports a number of tubes, C, for containing the leads. Several wires, D, project into these tubes, and are attached to a rod, E, that slides in the tube, A, and is adjusted by the screw, F, whose milled head is at the top of the tube, A.

Lines of different shades may be produced by using leads of different degrees of hardness.

A New Use for Warts.

Dr. Charles A. Seale, of this city, announces in the *Medical Record* that warts of the hand can be used with better results than small pieces of normal skin, in skin grafting, in consequence of being easily separated, uninjured, into numerous cylindrical rods of great vascularity, and containing a large proportion of hypertrophied epithelium, which, when planted in healthy granulating tissue, readily adapt themselves to the new soil, receiving direct nourishment, and quickly growing as starting points for a new and smooth epithelial covering.

In one case, in which there had been complete destruction of all the skin on the dorsum of the foot, involving to a great extent the deep cellular tissue, and where for several weeks no healing advanced, grafts of freshly removed warts from the patient's hand immediately started little islands of new tissue, which rapidly increased, until they coalesced and met the margins of the border skin, thereby completely covering the foot by firm, protecting integument.

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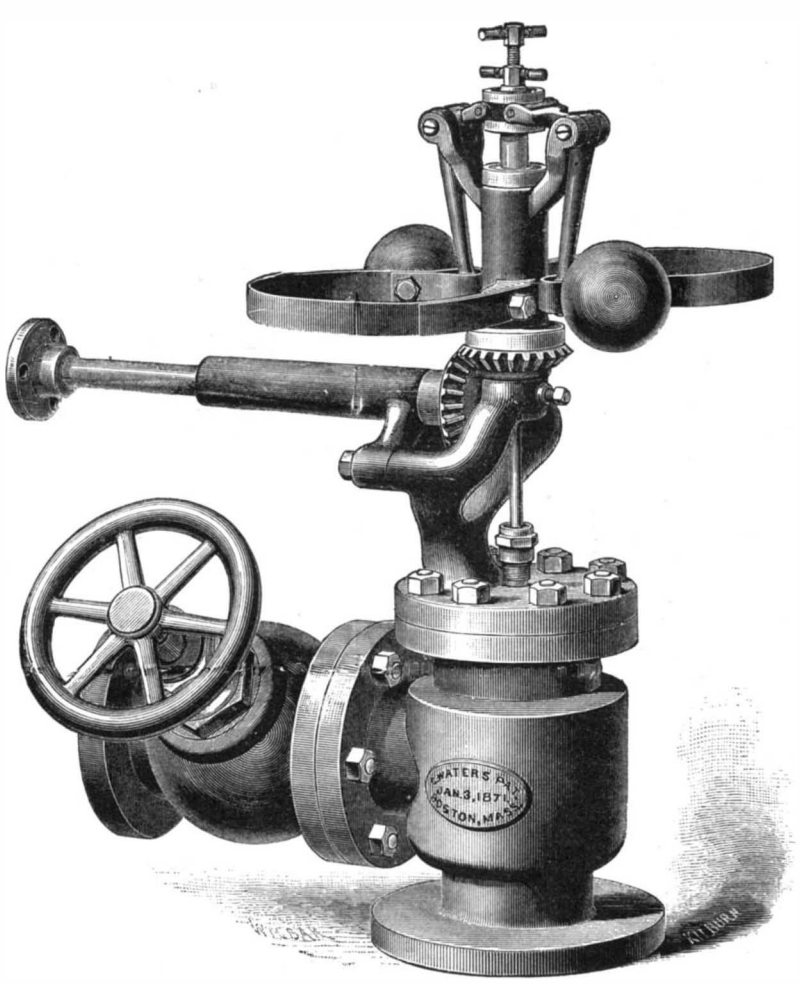
STEAM ENGINE GOVERNOR.

The accompanying engraving represents a steam engine governor with an automatic safety stop, applicable to both stationary and portable engines. It can be placed on a motor in either a vertical or horizontal position. The theory embodied in its construction is to relieve the joints of the ball arms or levers from friction, and also the weight of the ball; to have the balls always revolve in the same plane, without rising or falling, the force usually supplied by gravity being furnished by springs, which also sustain the weight of the balls. The valve is of much larger area than is usual in ball governors, the object being to insure the highest economy consistent with the use of plain engines, and also the nearest to perfection in regulating. The use of comparatively light balls, springs, and a medium high speed, all tend to correct results in regulation, especially if combined with large valves.

The governor is supported on a frame of novel design, which also closes the opening in the upper end of the valve chamber. The peculiar shape of this frame admits of easy access to the stuffing box, bolts, etc., even in the smallest sizes. Into this frame is fastened by a set screw a stud, which supports the casting composing the governor proper, and which is made to revolve around the stud. This casting is provided at the top with proper ears to receive the joints of the arms which revolve with it, and at the lower end with two projections, to which are bolted one end of a steel spring. The free end of this spring is formed into a slot, and also of such shape as to receive the ball, which is secured to the spring by bolts. One end of the arm is formed into a small ball, and fits loosely into the slot of the spring; the other end of the arm carries a piece of hardened steel, which works in a grooved composition collar, fitted to move up and down in the central stud. The valve-stem is screwed through this collar and communicates motion directly to the valve. The balls being supported and rotated by the springs, all friction is taken off the joints of arms, and the balls do not rise and fall by the rotation of the arm around its pivot, the slot in the spring compensating for all difference in motion. The end of the valve stem is extended through the top of the composition collar, and furnished with a handle with which to turn it, and a check nut to hold it in place. Screwing this stem down causes the engine to run slower; screwing it up causes it to run faster. The check nut holds it wherever wanted. The bearing of the horizontal shaft is bolted to the frame, and if broken off by accident, can be easily and cheaply replaced without damage to other parts of the governor. All bearings are made of Babbitt metal, and all parts are duplicate.

This governor is claimed by the manufacturers to be especially adapted to very small engines, as it is quick in its action; for this reason it is also a valuable one for steam engines in saw, flour, and rolling mills, and in all manufactories where the changes in the operation of the machinery are severe and sudden. The automatic safety stop, not seen in the engraving, consists of an arrangement which is simple, efficient and not liable to derangement. The revolving head of the governor is supported by a disk operating upon the edge of another disk of the same diameter, which is secured to the driving or horizontal shaft of the governor. The bearing of this shaft is held at one end in a forked lever by centers, and at the other by a shell or casing having a rib or projection on its interior surface. A like rib on the outside of the bearing prevents the weight on the end of the forked lever from dropping so long as the tension of the driving belt holds the ribs in contact. The instant the belt gives way the weighted lever falls, carrying the bearing outward, so as to disengage the gears and the supporting disks, when the revolving head immediately drops by its own weight, bearing with it the valve stem and valve, and instantly closing off the passage of steam to the engine.

This governor is in extensive use in this country and abroad. Further information may be had on application to the manufacturers, C. Waters & Co., Boston, Mass.



STEAM ENGINE GOVERNOR.

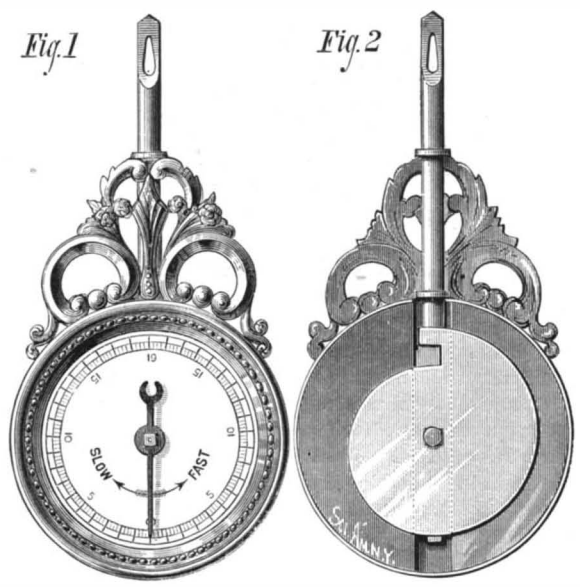
Aluminum and Platinum in the Manufacture of Watches.

In ordinary watches their correctness depends greatly on their position, whether this be a vertical or horizontal one. The reason is that the more rapidly rotating wheels principally, but more or less all of them, are made of too heavy material. Brass, or a similar composition, is, as a rule, too heavy, and, as an immediate consequence, it will not be immaterial whether a wheel presses with its full weight vertically upon the axis (that is, rests on the point of it), or whether the pressure of its weight is exerted on the circumference of the axis. The latter is naturally the more correct position, insuring a correct, even, and unchanged movement of the watch. Hence the steady desire to keep the watch in an upright position. Much less felt will be the influence of changed position, especially of hat of the more rapidly rotating wheels, if these are made of the thrice lighter aluminum instead of brass. Used for that purpose aluminium constitutes an important improvement, since the position then becomes a matter of no influence on the movement of the watch. The friction, and therefore the wear of the wheels, are reduced, and oiling may often be dispensed with.

Platinum, however, by its heaviness, is indicated for the manufacture of balances, as they become thereby more independent of exterior shocks.—*G. F. Reisenbichler, in Schweizer. Gewerbe-Blatt.*

NEW REGULATING ATTACHMENT FOR CLOCK PENDULUMS.

We illustrate herewith, in two figures, a novel and ingenious device for regulating clock pendulums, recently



JACOT'S REGULATOR.

patented by Mr. H. C. Jacot, of St. Louis, Mo. An arbor passes through the center of the pendulum ball, and is squared at each end to receive at the front an index, as shown in Fig. 1, and at the back a cam, which engages a lug on the extreme lower end of the pendulum rod, Fig. 2. The index moves over a small dial, which is graduated so that each number corresponds to one minute per day, so that by turning the index in one direction, the pendulum ball is lowered and the movement of the clock is retarded; by turning it in the opposite direction, the ball is raised and the movement accelerated. The key that is used for winding the clock is adapted to the regulator. This regulator is not only very useful, making the adjustment of the pendulum simple and positive, but it also adds greatly to the appearance of the clock, being itself an ornamental object.

Further information may be obtained by addressing the inventor, care of Messrs. Eugene Jaccard & Co., 300 North Fifth street, St. Louis, Mo.

Phosphorescent Time Pieces.

Some time ago it was reported that watches were being made in Switzerland with phosphorescent dials, so that the hour could be ascertained from them at any time of night without the aid of artificial light. Recently an Eastern clock company has been manufacturing clocks with this same kind of self-illuminating faces, and they have been on exhibition in the windows of several of our city stores.

M. Olivier Mathey, a Neufchâtel chemist, communicates the following information in regard to the composition of these dials to one of our French exchanges:

Phosphorescent dials are usually made of paper or thin cardboard, enameled like visiting cards; they are covered with an adhesive varnish, or with white wax mixed with a little turpentine, upon which is dusted, with a fine sieve, powdered sulphide of barium—a salt which retains its phosphorescence for some little time. The sulphides of strontium and calcium possess the same property, but lose it more quickly than the former. After the dial has remained in darkness some days it loses its phosphorescence; but this may be readily restored by exposure of an hour to sunlight, or, better still, by burning near the dial a few inches of magnesium wire, which gives forth numerous chemical rays.

Bee Culture in Egypt.

The Egyptians exhibit great skill in their manner of cultivating the bee. The flowers and the harvest are much earlier in upper Egypt than in lower, and the inhabitants profit by this circumstance in regard to their bees. They collect the hives of different villages on large barks, and every proprietor attaches a particular mark to his hive; when the boat is loaded, the conductors descend the river slowly, stopping at all places where they can find pasturage for the bees.

After having thus spent three months on the Nile, the hives are returned to the proprietor, and after deducting a small sum due to the boatman for having conducted his hives from one end of Egypt to the other, he finds himself on a sudden enriched with a quantity of honey and wax, which is immediately sent to the market. This species of industry procures for the Egyptians an abundance of wax and honey, which they export in large quantities to foreign countries.

New Mechanical Inventions.

Mr. Joseph Hackett, of Louisville, Ky., has patented an improved Moulding Machine for light castings, by which the moulds may be made quicker and better than by hand.

Mr. Frank A. Buell, of Brooklyn (E. D.), N. Y., has patented an improved Saw Set, having a forked shank adjusted by a bolt, and provided with arms having gauge screws for limiting the set of the tooth.

An improvement in Insulating Railroad Tracks has been patented by Mr. Louis Bastet, of Brooklyn, N. Y. The object of this invention is to insulate the rails of railroads from the structure upon which they rest, so that the vibrations caused by passing trains will not be communicated to the supporting structure, so as to be diffused.

Mr. Francis J. Hanna, of Kane City, Pa., has patented an improved Oil Well Pump, having a tubular piston, open at each end, and provided with a ball valve at the top, and connected by a centrally open coupling with tubular piston rod, the whole being arranged to operate in a pump barrel that is perforated at its upper end.

An improved Locomotive has been patented by Mr. Jacob J. Anthony, of Sharon Springs, N. Y. It consists in a rectangular water tank, adapted to receive the locomotive boiler, and constructed with a recess to receive the cranks and connecting rods of the locomotive.

Mr. Seth Kethledge, of Center Point, Iowa, has patented an improved Lumber Measure, in which the motion of the spur wheel or toothed disks is transmitted to an indicator which has a reciprocating rectilinear motion longitudinally of the carrying frame or case. No adjustment is required for the purpose of measuring boards of different widths. Instead of a circular dial there is a scale marked with figures arranged in columns extending longitudinally on the surface of the carrying frame or case, and a separate column is provided for each of the different standard lengths of lumber.

Mr. Thomas N. Jordan, of Mobile, Alabama, has patented an improved Machine for Holding and Guiding the File in saw filing, so that a saw may be filed with accuracy and dispatch, even if the operator is unskilled.

THE experiment with 5½ foot driving wheels, on the New York division of the Pennsylvania Railroad, after some improvements had been made, is said to be entirely successful. A great advantage is gained in draught and speed, and the trains using them have no difficulty in making the distance between Philadelphia and New York in two hours.

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FRENCH SUBSOIL AND CLEARING PLOW.

In the official trial of steam plows at Gonesse, Depart ment Seine et Oise, August 10, a few plows, drawn by horses and oxen, were shown upon the ground in order to enable comparisons upon the spot of the steam and horse culture. A double Brabant plow was drawn by six yokes of oxen, plowing to a depth of 45 centimeters, about 18 inches, and subsequently the wire rope from the locomobile was attached to the same plow in lieu of the oxen.

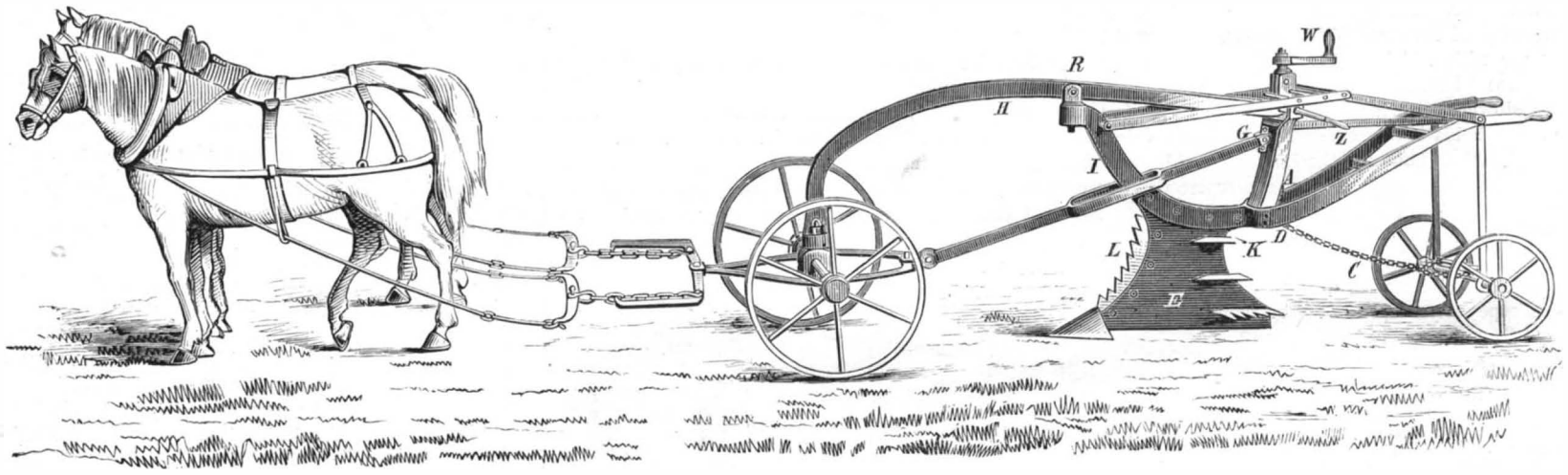
A small Brabant plow was then drawn by a pair of horses, and the machine represented, the Bourdin subsoil and clearing plow, was driven in the same furrow, stirring, lifting, and pulverizing the subsoil.

It has a deep, thin body, E, with a notched breast, L, a triangular share in front, and horizontal knives, K, when it has to be used to cut roots in ground lately cleared of bushes and shrubs.

To keep the sole of the plow level and preserve the gauged depth, the plow has, in addition to the draught rod, which reaches from the fore carriage of the plow to the standard, a second beam, H, to which the forward upward turned end of the beam, I, is pivoted at R. This forms a species of quadrilateral frame, whose pivoted angles permit such adjustment in the share frame as to raise or depress the point of the share, either to enter or rise from the soil, or the soil to run level at the depth for which it is set. The crank, W, and screw, operating upon the hind end of the draught rod at G, give the necessary adjustment.

C is a draught chain to the hind carriage, which also rides upon the ground and aids in keeping the plow level. When the wheels are withdrawn from supporting the handles, A, the rear end of the plow droops, and, the share pointing upward, the plow comes out of the ground.

The doubletree is an equalizer, permitting the adjustment of the leverage according to the different strengths of the horses in the team.



BOURDIN'S SUBSOIL AND CLEARING PLOW.

The conductor can, without stopping, change the land or depth of the plow by the handle, W, for depth, and Z for land.

It is the newest thing in its line in France and has attracted much attention. The blades, K, are removed, excepting when roots are to be cut, and the intention is to divide them into such short pieces that there will be no need to remove them from the soil. EDWARD H. KNIGHT.

Paris, October 1, 1878.

Removal of the Entire Scalp by Machinery.

At a recent meeting of the New York Pathological Society, reported in the N. Y. *Medical Journal*, Dr. Finnel presented, on behalf of a candidate, the entire scalp of a woman 28 years of age. While visiting an oleomargarine factory, she stooped down to examine some of the processes. Behind her head was a revolving shaft, and in some manner her long hair became wound round the shaft. The rapidity of the shaft was such that the whole scalp was torn off without giving sufficient pain to draw her attention to the condition of her head. The first sensation she experienced was coldness of the head, and on putting up her hand she found that her hair was gone. Following the injury there was no shock and no pain. On examining the head the denuded surface was seen to extend from the base of the occiput to the left eyebrow. The eyebrow was gone, and the left ear was so much injured as to hang down by a strip of skin.

The scalp measured 24 inches in circumference, and was attached to the hair 32 inches long. It was at first proposed to apply the scalp, but on examining there was noticed such an amount of grease adhering to the raw surface that any effort at union was thought to be useless.

Dr. Finnel said it was the intention to tan the scalp, and thus allow the patient to use her natural hair, but not in the natural way.

Dr. Abbe referred to a similar case which occurred four years ago, and was under treatment in St. Luke's Hospital. The amount of scalp removed was nearly identical with that presented, and the manner in which it was done was similar. Three months after the injury, granulation extended over the denuded cranium. It was found, in the use of grafts, that those only were successful that were placed within an inch from the cicatricial margins. The grafts were the size of canary seed, and, during the four years that the process of cicatrization continued, about twelve thousand were used.

Dr. J C. Peters referred to the case of a waiter at a club house, who was scalped by a falling mirror. The scalp was separated into two flaps, which were attached at their base. These were brought into position, and within a few days union took place.

Opening for Trade in Madagascar.

The island of Madagascar has an area of about four times that of England and Wales, with an estimated population of five millions. Writing from the capital of the island two years ago, Consul Robinson said that the demand for American cotton manufactures was increasing, and that, in addition the American traders, one English and one German house, were importing American fabrics. More recently a correspondent writing from Andovalaly, Madagascar, said that all kinds of agricultural and woodworking machines were needed there, and that there was a good sale for American cottons at a handsome profit when the quality was good. Complaint is raised, however, that too few American vessels visit the island, and that those which do trade there sail from home as though venturing on a piratical expedition, studiously concealing their destination in order to keep the trade in a few hands.

Handling Grain in Buffalo.

A correspondent of the Cleveland *Herald*, writing from Buffalo, says: "Nearly all the elevators are grain, and immense amounts are going forward constantly by canal and rail. The freight line propellers appear to have the preference over outside vessels in unloading. The appliances for getting wheat out of a ship are far in advance of those of a few years ago. Nearly all the work, including shoveling the grain in the hold to the cups of the elevator, is done by steam power supplied from the shore engine, and during the night the hold is illuminated by gas conducted from the building in rubber tubes. A steamer carrying 60,000 bushels is unloaded in a single night, and two canal boats are frequently brought along outside the propeller and fill at the same time the grain is coming out of the ship."

THE BLUE PROCESS OF COPYING TRACINGS.

This process has been in use in France for several years, though American engineers have but recently begun to appreciate its value. It is a strictly photographic process, the tracing being used instead of the ordinary glass negative. In a paper read before the American Institute of Mining Engineers, Mr. P. Barnes suggested that the drawing might be finished or nearly so in pencil upon paper in the usual way, and that all the inking be done upon tracing cloth laid upon the pencil work.

For the sensitizing solution take 1 7-8 ozs. citrate of iron and ammonia, and 8 ozs. clean water; and also 1¼ ozs. red prussiate of potash, and 8 ozs. clean water; dissolve these separately, and mix them, keeping the solution in a yellow glass bottle, or carefully protected from the light.

The paper may be very conveniently coated with a sponge of four inches diameter, with one flat side. The paper may be gone over once with the sponge quite moist with the solution, and the second time with the sponge squeezed very dry. The sheet should then be laid away to dry in a dark place, as in a drawer, and must be shielded from the light until it is to be used. When dry the paper is of a full yellow or bronze color; after the exposure to the light the surface becomes a darker bronze, and the lines of the tracing appear as still darker on the surface. Upon washing the paper the characteristic blue tint appears, with the lines of the tracing in vivid contrast.

Any good hard paper may be employed (from a leaf from a press copy-book up to Bristol board) which will bear the necessary wetting. The manipulations required are simple, and may be intrusted to any intelligent office boy. They are summarized by Mr. Barnes as follows:

1. Provide a flat board as large as the tracing which is to be copied.

2. Lay on this board two or three thicknesses of common blanket, or its equivalent, to give a slightly yielding backing for the paper.

3. Lay on the blanket the prepared paper with the sensitive side uppermost.

4. Lay on this paper the tracing, smoothing it out as perfectly as possible, so as to insure a perfect contact with the paper.

5. Lay on the tracing a plate of clear glass, which should be heavy enough to press the tracing close down upon the paper. Ordinary plate glass of ⅜ inch thickness is quite sufficient.

6. Expose the whole to a clear sunlight, by pushing it out on a shelf from an ordinary window, or in any other convenient way, for six to ten minutes. If a clear skylight only can be had, the exposure must be continued for thirty or forty-five minutes, and under a cloudy sky, sixty to ninety minutes may be needed.

7. Remove the prepared paper and drench it freely for one or two minutes in clean water, and hang it up to dry.

We Buy of those that Advertise.

The London correspondent of the Cincinnati *Enquirer* tells the following story. The moral will be obvious to those who have anything to sell:

In Paris, last summer, I saw a friend of mine, who had just come over, using a pen of peculiar construction, designed with special reference to those untidy persons who, like myself, ink their fingers when they write. Now my friend is a man whose hands are as white as lilies, with finger nails like rosebuds in tint—noticeable hands, even remarkable, considering that he is an elderly man, and who occasionally helps with the lighter work on his farm in Nebraska. Catch him inking his fingers!

"Why, where did you get that nice pen?" I asked him, a vista of blissful exemption from an uninked middle finger opening on my joyous, expectant mind.

"In Omaha," he answered. "It's the nicest thing. I used to ink my fingers before I got it!"

He did! He inked his fingers! That was enough for me. I got the name of the merchant from whom he bought the pen, the price of it, and inclosing the money, I sent from Paris to Omaha for the pen.

By the last steamer it came to me. The stationer at Omaha was out of them, but he sent to Sioux City to the man that advertises them for another lot. And now here is where the laugh comes in. The pens are an English invention, and tons of them can be bought in London if desired. At the stationer's next door I could have got what I had sent after to Sioux City. But how could I know that? I dealt with the man that advertised.

Unprofitable Agents.

A late Commissioner of Patents calls attention to a prolific source of disappointment and loss to inventors—incompetent patent attorneys, as follows: "A large percentage of the cases filed in the office are prepared by men who have little knowledge beyond mere forms. These are often subordinates dismissed from the office or from private firms for incompetency, or draughtsmen, or model makers. Specifications filed by these attorneys are frequently so imperfect and obscure as to be unintelligible and utterly unfit for publication, and the preparation of these cases increases the labor of the examiners, and are a fraud upon the inventors. Inventors are particularly cautioned against men who claim to have special facility in the office, or who intimate that money may be used to hasten or assure the allowance of their cases."

The Probable Starting Point of the Yellow Fever.

Last September the New Orleans *Times* asserted that the yellow fever epidemic began its malignant course in the front part of the city, where "four thousand loads of kitchen garbage, which had been hauled to the dumping grounds by the city carts, had been brought back by the contractors and used to fill up the streets."

A committee of citizens, appointed by the Mayor of New Orleans to investigate the matter, have reported that the charge is substantially correct. After describing in detail the horribly offensive condition of the filled-in streets and squares, the committee say that "if the fearful pestilence did not originate there, it was largely fed by the evils made known, until the material was exhausted, when the roll of death added new victims to the feast."

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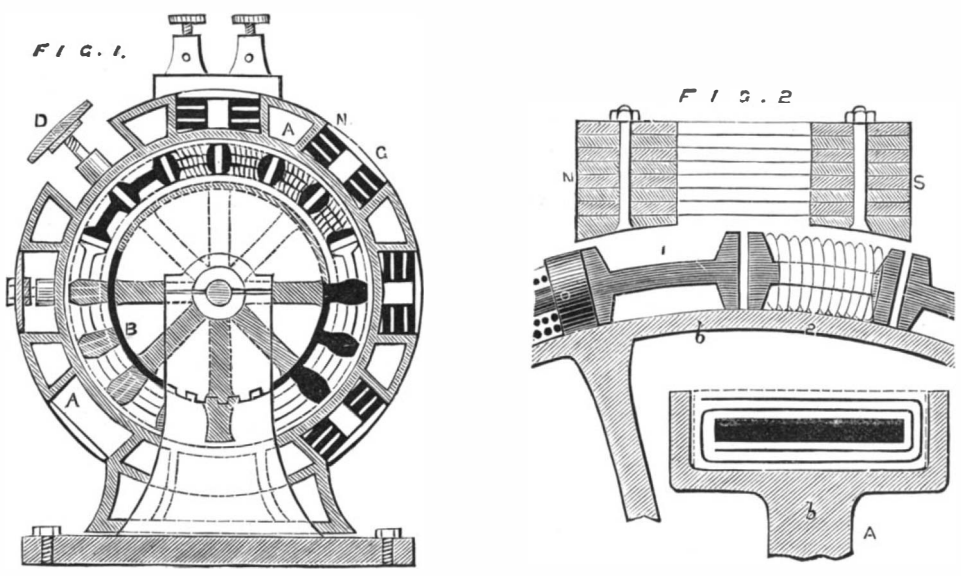
THE DE MERITENS MAGNETO-ELECTRIC MACHINE.

This machine, although not yet before the world in actual use, it is claimed, will effect a great reduction in the amount of engine power required to develop a given current.

Mr. J. T. Sprague, in the *English Mechanic*, says its construction is so simple, and its results so satisfactory, that it seems destined to play a part in the early future.

The machine is really a combination of the principles of the Alliance machine and the Gramme. Several Alliance machines have been converted into the new type.

Fig. 1 shows a front view of the Meritens machine, in which A A is a brass ring, containing recesses to carry compound horseshoe magnets, which are arranged, therefore, at right angles to the radii of the frames, two of which are required to support them. The way in which the magnets are retained in place is shown at *a*, a loose piece completing the arc of the frame being firmly screwed down on the magnets. The rotating armature of the Gramme machine may be compared to a cart wheel, the tire of which is wound with a wire continuous in itself, but still separated into a series of segments, or arcs of the circle, by means of conducting wires led to a complex commutator on the shaft. The Meritens coil is similar to a Gramme armature, but it is divided itself into a series of segments, separated magnetically by brass pieces, and bound together by means of a brass frame, *b*, shown more fully in Fig 2, as also in section. In Fig. 1 this ring is shown dissected, and it is intentionally drawn a little too small as compared with the outer frame, in the machine, of course, the ring runs as close as possible under the concave ends of the permanent magnets, *n s*. In Fig 2 this is shown more completely, 1 being the iron core, and 2 the same with the wire wound on it, working under the magnet poles, N S. The cross section, A, shows the rim lying on the ring, *b*, by which it is rotated, and to which the segments are secured by lugs corresponding to the expanded ends or poles of the several segments, which are bolted through to these lugs.



THE DE MERITENS MAGNETO-ELECTRIC MACHINE.

The machines at present making have eight permanent magnets. They are arranged to work with three or four of the Jablochkoff candles, and it is claimed that running at 700 revolutions per minute, with three candles in operation, they require only one horse power to drive, all the others under such conditions absorbing three horse power.

One special feature of the machine is that it has no commutator. There are simply two springs, forming the terminations of the wires (being themselves connected to the binding screws) by means of two insulated rings in the shafts, which are connected to the wires; the alternating currents set up in the segments are thus passed direct into the circuit without any loss in sparks, or by the short circuits formed in the ordinary commutators. The construction of the rotating ring combines the actions of the ordinary magneto-electric machines with those of the Gramme. As the ring rotates under each single pole, a succession of molecular magnetic reversals takes place, and the spires of the wire are also traversing a magnetic field, both actions combining, as in the Gramme, to set up a current. As the ends of each segment come under the several pairs of magnet poles a powerful magnetism is induced in the core, which, immediately after, undergoes a sudden reversal, and these actions set up their proper electric currents as in the old-fashioned magnetic apparatus, and as in the Alliance machine. The wires of the different segments are so connected as to act either for quantity or tension, as desired, or could, of course, be collected separately for different circuits. The iron cores are built up out of a piece of sheet iron stamped to the required shape, both for readiness of making and to avoid induction currents in the core itself, and the wire can be wound on nearly as easily as on a common electro-magnet, so that the construction is very simple.

Various Uses of Paper.

The *Western Paper Trade* sums up the following list of articles manufactured of paper displayed at the recent Berlin exhibition: Animals, washbasins, water cans, carpeting, bonnets, a ship full rigged, lanterns, hats, masks, skirts, clothes, full suits, straps, handkerchiefs, napkins, bath tubs, buckets, bronzes, flowers, urns, window blinds, asphalt roofing, material for garden walks, coral, jewelry, window curtains, shirts, lace, belting, and a house made of pine, but with not only roof, ceiling, cornice, and interior walls of paper, but all the furniture, blinds, curtains, chandeliers, carpeting, ornamented doors, numerous mantel and table ornaments, and finally a stove of asbestos paper burning away cheerfully, and not consuming itself, as it evidently ought to do. All these things indicate some of the possibilities of the adaptation of paper. Who shall say where these possibilities end?

Tula Silver.

The article manufactured under that name in Tula, Russia, is at present manufactured on a large scale by Zacher & Co., in Berlin, who succeeded in lifting the vail of the secret of its manufacture. Tula silver is a composition of 9 parts of silver, 1 part of copper, 1 part of lead, and 1 part of bismuth. These metals are melted together in the given proportions, and worked with as much sulphur as they may be able to take up. Thus a composition of a peculiar blue color is obtained, which has on that account, in some places, been called blue steel.—*Der Bergmann.*

Wall Wash.

A new coating for walls has been invented, which consists of a spirituous solution of stearate of soda, prepared in the proportion of 50 grammes of stearate dissolved in 1,000 grammes of spirits of wine, and of a strength of 66 per cent. Other solutions of soap in spirits of wine of more or less strength may be used; but stearate of soda forms the hardest and most impermeable coating, though more expensive. For stables spirituous solutions of common brown soap or soft soap suffice, but the stronger the spirits the better. The solution may be colored with aniline colors, yellow ocher, or dragon's blood. It takes well on wood, lime, or cement. Zinc colors are suitably fixed beforehand, solution of chromate of alum being recommended.

IMPROVED CRUSHER AND GRINDING MILL.

The utilization of waste is an economy which is practiced more and more as the world grows older. The soil which yields up its constituents to vegetation must be replenished or re-enriched, for it has lost that which is more valuable than gold, and it will not continue to yield without compensation. Agriculturists have, in one way or another, attempted to keep up the standard of productiveness, but have, until a comparatively recent period, for lack of knowledge as to their value and for want of suitable machinery for reducing them to the proper state, neglected the bones, horns, hoofs, and other solid refuse, which have been only a burden and a nuisance, though in reality the best of fertilizers.

We give herewith engravings of two machines manufactured by Messrs. Walker Brothers, 23d and Wood streets, Philadelphia, for reducing these waste materials to a usable form, and for other industrial uses.

Fig. 1 is a perspective view of a mill for crushing bones, fire brick, clay, phosphates, and other similar substances. Fig. 2 represents a mill for grinding bones, hoofs, horns, phosphate clay, cement, and such like matters.

These machines are well made and, being wholly of iron, are substantial and durable. They are manufactured under Mr. Wm. Stewart's patents, and are well calculated to give good results.

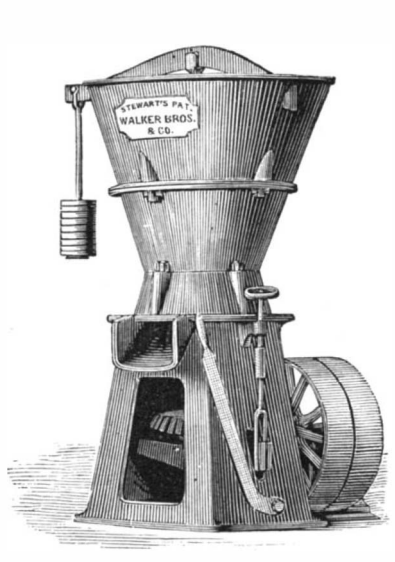


Fig. 1.—CRUSHER.

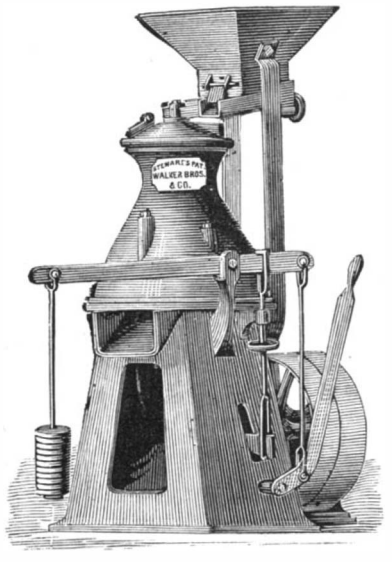


Fig. 2.—GRINDING MILL.

New Inventions.

An improvement in Machines for Flaring and Crimping Lamp Chimneys, etc., has been patented by Mr. Charles H. W. Ruhe, of Pittsburgh, Pa. This is a simple and effective adjustable tool for widening the necks of glassware after the same has been formed by blowing in a mould or by hand, and for otherwise ornamenting the edge with grooves or corrugations, notches, or scallops.

Mr. John R. Davis, of Inland, Ohio, has devised an improved Block for the purpose of illustrating the extraction of roots of numbers to an indefinite number of places, and also the involution of any number to any power. The block also admits the demonstrating of roots and powers of proper or improper fractions, common or decimal, and admits in simple manner the explanation of the different steps in extracting roots or involving powers from numbers.

Mr. John J. Ougheltree, of Rondout, N. Y., has patented an improved Music Leaf Turner, of that class in which a number of swinging fingers or arms are placed between the leaves of the music, and successively tripped by the player, so as to quickly turn the leaves. It is provided with a number of pivoted arms or fingers that swing in a vertical plane and are tripped by key levers. The music is clamped to an upright center post of the base, so as to be retained while the leaves are turned.

Mr. Theodore W. Clark, of Oregon City, Oregon, has devised an Automatic Attachment to Fulling Machines, whereby the length of the goods can be ascertained while being fulled, and the amount of shrinkage in length determined without removing the goods from the machine.

A permanent Mould for Casting Sash Weights, which will be available for use at any time, and suited for various sized weights, has been patented by Messrs. Edgar P. Davis and Walter J. Godfrey, of Omaha, Neb. It consists in an iron or steel mould divided in two parts, and constructed so as to be adjustable in length. It is also made with lugs and pins to form the eye for the cord.

Messrs. Ashley W. Holland and Edgar N. McKimm, of Lathrop, Mo., have devised an Animal Trap which is provided with a cover having a grain jacket or chamber at the sides, the latter having a cover of wire gauze.

Messrs. Ole Johnson and John Johnson, of Cresco, Iowa, have patented an improved Car Coupling that couples the cars automatically without exposing the attendants to danger through their stepping in between the cars. The coupling is adapted for cars of all kinds and heights, and may be uncoupled from the side or top of the car.

Mr. William Hinchliffe, of Nashville, Tenn., has patented an improved Door Fastening, which is so constructed that it may be used to fasten the door when closed or when partly open.

Mr. Patrick Gallagher, of Eureka, Nevada, has patented an improved Bench Plane, in which the cutting iron lies flat and makes a smooth cut in the wood. It is more easily adjusted than in the old styles of planes, in which the iron is retained by a wedge piece.

An improved Ticket and Label Holder has been patented by Mr. John H. Mitchell, of Bloomfield, Iowa. This is called a druggist's label cabinet, and is more particularly intended for the use of druggists and apothecaries, for the purpose of keeping labels in order and in place ready for use; but it may be employed as a holder for labels, cards, or tickets for various other purposes.

An improvement in Lanterns has recently been patented by Mr. Eugene Tufts, of Malden, Mass. The object of this invention is to obviate the blowing out of the light by gusts of wind or by a swift movement of the lantern.

An improved Revolving Index for bookkeepers and others requiring the use of an index in their business has been patented by Mr. Lübbe Ulfers Albers, of Keokuk Junction, Ill.

An improvement in Machines for Stretching and Drying Cloth has been patented by Mr Darius Babcock, of Oswego, N. Y. In this invention there is combined with the narrow jointed bar link in common use a wider link, the lower edges of the narrow link resting on stationary pulleys, and the tendency to draw inward caused by the transverse strain placed on the chain while in use being guarded against, and the links guided in a proper vertical position by horizontal flanged pulleys, between the inner faces of which the upper and lower edges of the ordinary narrow link move, and on the adjoining sides or peripheries of which the wide links move, the joints of the links being offset, so as to leave the edges of the same with smooth and unbroken surfaces, against which the pulleys may revolve.

Mr. John Hoerr, or Denison, Texas, has patented a Compact Cooling Attachment for lager beer, ale, and other barrels, by which, with but a small expense for ice, the contents may be kept in a cool state for a long time.

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Recent Engineering Inventions.

An improved Car Journal Box has been patented by Mr. Francis M. Alexander, of Marshall, Texas. This invention relates to oil boxes used upon journals of car axles, the object being to prevent the lid from shaking off of the oil box and getting lost, and to enable the oil stop or oil packing surrounding the axle to be removed and replaced by a new one without removing the box from the journal.

Mr. Peter Boisset, of New York City, has devised an improved Propeller, which consists of one or more feathering paddles, that are hinged to the lower ends of oscillating arms, operated by crank rod connections with an oscillating crank shaft. The paddles may be adjusted at any angle or direction. The supporting frames of the paddle arms may be raised or lowered, so as to give more or less dip to the paddles.

The Cultivation of the Common Nettle.

The common European nettle (*Urtica dioica*) was formerly held in much esteem on account of its long delicate fibers, which, being readily separable and easily bleached, were particularly adapted for the manufacture of fine tissues. Although the fibers of this plant possess all the qualifications necessary to constitute a good textile material, the introduction of flax culture from Asia drove the industrial use of the nettle out of the manufacturing world entirely. From the little information that we possess in regard to the matter, we are led to suppose that the plant was abandoned on account of the superiority of yield in the flax; for the nettle, in its wild state, furnishes only about one and a half per cent of the weight of the plant in pure textile fabrics—a yield greatly inferior to that of any other plant used for like purposes. The attention of the industrial world has been, however, directed anew to the qualities of the nettle by very beautiful specimens of papers exhibited at the Vienna Exhibition in 1873, and which were manufactured at Hermanetz, Hungary, from wild nettles collected in the woods of the latter country. Since that period to the present quite a number of experiments have been attempted, either to acclimate in Europe different species of Indian or Chinese nettles, or to cultivate the common European nettle. The exotic species, among which should be mentioned the China grass (*Bœhmeria ramie*), were unable to withstand the rigors of a European winter, and their yield, too, was found to be greatly inferior to what it was in their native country. Experiments in this direction, therefore, promising so little success, have been abandoned; not so, however, with the culture of species indigenous to Europe, for this, judging from what is said by recent foreign papers, would seem to have better prospects.

We learn from a German contemporary that serious trials are now in progress in a two acre field at Stralau, near Berlin, to determine whether the nettle can be cultivated with success, with the view of producing therefrom a textile fiber. The plant was sown last year, and acquired a height, last autumn, of three to four feet, but contained too many branches to make it useful for the production of fiber. The present year, however, the plant looks much better, has fewer branches, and is generally four, and in some cases five or more, feet high. The field in question has been neither manured nor weeded, but the nettle has shown its strength by itself suppressing all weeds. The fear that the nettle would escape into adjoining fields has proved groundless, and an adjoining cabbage field does not contain a single nettle plant. The plants are now in full bloom, and a trial was to be made to cut them at this stage, in order to obtain the fiber in its greatest degree of whiteness. Should this succeed, it will be possible to obtain two crops in one year, a point of very great advantage should the fiber ultimately become a marketable product.

If these interesting experiments and observations should prove the possibility of growing the plant, and obtaining therefrom, as in China, Japan, and India, a useful fiber, there are many at present unproductive fields in Europe, as well as in America, which could be turned to a profitable account. That this plant does produce a useful fiber is shown by its very name, for in German it is a term often applied to calico, thus indicating that cloth brought from the East had been manufactured from it.

The Economic Products of Sea Weed.

The Society of Arts, in 1862, awarded to Mr. E. C. C. Stanford their silver medal for a paper on the economic applications of sea weed. The principal use of these plants at that time was in the production of "kelp," which was afterwards used for making lye for soap boilers and in glass making; and the spent lyes of the former manufacture were used in the preparation of iodine. Mr. Stanford proved that the excessive heat employed in the manufacture of kelp dissipated in smoke more than half the iodine contained in the sea weed; and that at the same time the alkaline sulphates were reduced by the carbon to lower oxy-compounds, and at a subsequent operation required an amount of sulphuric acid to reconvert them, which cost $2.75 to $3.25 a ton of kelp—the whole cost of extracting the salts and iodine from the same quantity being only $6.25 to $7. These facts led to the destructive distillation of sea weed as a commercial undertaking, now carried on on a vast scale by the North British Chemical Company. The products which have a commercial value are, per 100 tons of dried sea weeds, volatile oil, 181 gallons; paraffin oil, 225 gallons; naphtha, 102 gallons; sulphate of ammonia, 63 cwt.; acetate of lime, 9 cwt.; charcoal, 17 tons 4 cwt.; gas, about 116,100 cubic feet; chloride of potassium, 7 tons 16 cwt.; chloride of sodium, 8½ tons; iodine, 326 lbs.; and other products. The gas obtained is used to light the works. The gas liquor yields ammonia and acetic acid. The charcoal left in the retorts yields, by washing, salts of potassium and sodium, with iodides and bromides, and the remaining charcoal (which resembles that prepared from bones) is a powerful deodorizer and decolorizer, and is the cheapest in the market. The collection of the sea weed affords employment to a large and indigent population in the Western Isles, far more remunerative than that of kelp, the burning of which it has largely replaced. The company has works in the shires of Dumbarton, Argyle, and Inverness, and in County Clare. The refining works at Whitecrook employ about 200 men, and are capable of producing annually 50,000 lbs. of iodine, 5,000 lbs. of bromine, 50,000 lbs. of iodide of potassium, 50,000 lbs. of bromide of potassium, 2,000 tons of caustic soda, 1,000 tons chloride of potassium, 100 tons chlorate of potassium, and sea weed charcoal in large quantities. Besides these, chloride of calcium is produced to a large extent in the manufacture of chlorate.

THE POISON IVY AND VIRGINIA CREEPER.

These are two vigorous climbing vines, common, and often found associated, in our woods and thickets, and which,

POISON IVY.

having to the unpracticed eye a general similarity of appearance, are frequently confounded, usually to the painful cost of the person who inadvertently comes in contact with the wrong one. These two plants, the leaves of which are represented in the accompanying engravings, are the poison ivy (*Rhus toxicodendron*), or, as it is also called, poison oak and mercury vine, and the Virginia creeper (*Ampelopsis quinquefolia*), or American ivy. The cases of poisoning resulting from contact with the noxious poison-ivy of so common occurrence during summer will probably prove still more numerous during the fall, when the brilliancy of the autumnal tints invite more than a usual number (of ladies and children especially) into the woods to gather autumn leaves. We have therefore thought we would be doing a service in figuring the plants, and giving such descriptions as would serve to enable any one to distinguish between the two. When the facts have been pointed out, the person destitute of the least idea

VIRGINIA CREEPER.

of botanical science will at once perceive that the points of resemblance between these two vines are really very few indeed; or, to speak absolutely correctly, that there are none at all.

There are two varieties of poison ivy, so marked that they have been considered distinct species. One of these, a small, weak, erect, or decumbent shrub, has leaves of three leaflets, which are ovate, and variously notched or lobed. This is the *Rhus toxicodendron*, and the variety figured in our engraving. The other form is distinguished by its climbing habit; the woody stem, covered with a grayish scaly bark, becomes one to four inches in thickness, and throws out throughout its whole length myriads of thread-like, densely aggregated rootlets, which serve to bind it closely to its support. It is extremely common, and may be seen embracing even fences, as well as infolding large trees, with its snaky branches. Like those of the erect variety, its leaves consist of three leaflets; but in the present case these are smooth and have entire margins.

Both varieties, when wounded, exude a milky juice, which becomes black on exposure to the air and upon fabrics forms an indelible stain. To most persons this plant is extremely poisonous; some indeed being so sensitive that they never fail to experience its noxious effects when they merely approach but do not touch it. The remedies which have been and are constantly being proposed for the painful inflammation, swellings, and itchings that follow from contact with the plant are innumerable; and the reputed beneficial effects of many of them are perhaps absolutely *nil*, the fact being overlooked that the disease ran its course and ended, taking no less time to do so than it would have done without the extraneous aid.

The Virginia creeper, for which the poison ivy is often mistaken, is a very graceful woody vine, climbing extensively, sometimes over fences and wall, but often up trees as high as fifty feet or more. Unlike the *Rhus*, it climbs by means of tendrils, the ends of which terminate in sucker-like disks. This alone constitutes a striking difference in the appearance of the trunks of the two vines; but the structure of the leaves forms one equally as noticeable. These, in the Virginia creeper, are palmately divided into five oblong toothed leaflets of a dark shining green, and with very prominent veins and ribs. The leaves of the Virginia creeper assume in autumn the richest shades of scarlet, crimson, and purple, and as the plants are seen climbing and intertwining among the foliage of some evergreen, or trailing over fences and walls, form one of the brightest ornaments of the season. The leaves of the poison ivy also become colored in autumn, but the tints are not so brilliant as those of the former plant; they are usually of various shades of yellow and dull red.

The Virginia creeper belongs to the grape family, and, indeed, was formerly placed in the same genus with the grape. It is hardly necessary to say that it is perfectly harmless. It may be well for those who do not pretend to any botanical knowledge to remember the following as a safe rule by which to be guided: No native American vine having five-parted leaves is poisonous.

The Japanese Wax Tree in California.

The most important article for illuminating purposes in Japan is the candle made from the fruit of the *Rhus succedanea*, a tree about the size and appearance of the common sumac of this country. It is grown more or less extensively in Japan, and especially in the Western Provinces. According to the San Francisco *Bulletin*, specimens of this tree have been imported to that city by Henry Loomis. The tree has a quick growth, and attains the diameter of a foot and a half and a height of twenty-five feet. They should be planted about seven feet apart, and shaded on the sunny side for the first season. The ground should be well stirred and kept free from weeds. They begin to yield berries the third year, but in California may bear the next year after planting.

The berries are the size of a small pea, of a white color, hanging in clusters, and contain the wax between the kernel and the outer skin. The full-grown tree averages fifty pounds of seeds annually, about one-half of which is wax. It is a hardy plant, growing on indifferent soil, and living for many years. In Japan they are planted by the roadside, on embankments, and out of the way places. The wax is obtained by the berries being crushed, steamed, and then placed in hemp bags and pressed in a wedge press. It is also obtained by boiling the bruised seeds and skimming the wax from the top. In ordinary candle making the unbleached wax is used. When washed and bleached in the sun and air it assumes a pure white color. When formed into candles it gives a fine, clear light.

The vegetable wax of commerce is the imported article from Japan. From experiments made, it is represented that it can be readily and profitably grown in California. The tree is highly ornamental. As the foliage changes it has the peculiar bright and attractive hues so remarkable in the autumn landscapes of the Eastern States. The wax is valuable for candles, making the gloss for linen, for waxing thread, and for other purposes for which the ordinary wax is used.

Piedra.

Under this name, according to the *Lancet*, a parasitic disease of the hair, supposed to be a previously known affection, has been described to the French Academy of Sciences by M. Desenne. It has been met with in Columbia in the natives of the province of Cauca. It consists in small nodosities visible to the naked eye, and as hard as stone, resisting and even turning the edge of the scalpel. The hair when properly prepared for microscopical examination presents, under an amplification of 140 diameters, the following appearance. The nodules are placed at a tolerably regular distance apart, without being arranged with any mathematical exactness. They are of two kinds, some surrounding the hair completely, like a fusiform ring; others incompletely, or forming nodules on one side. Under a higher power they are seen to consist of a cellular mass of polygonal elements ·012 to ·015 millimeter in diameter, and regularly arranged, a black line only indicating their intervals. Adjacent to one of these nodosities a network could be seen consisting

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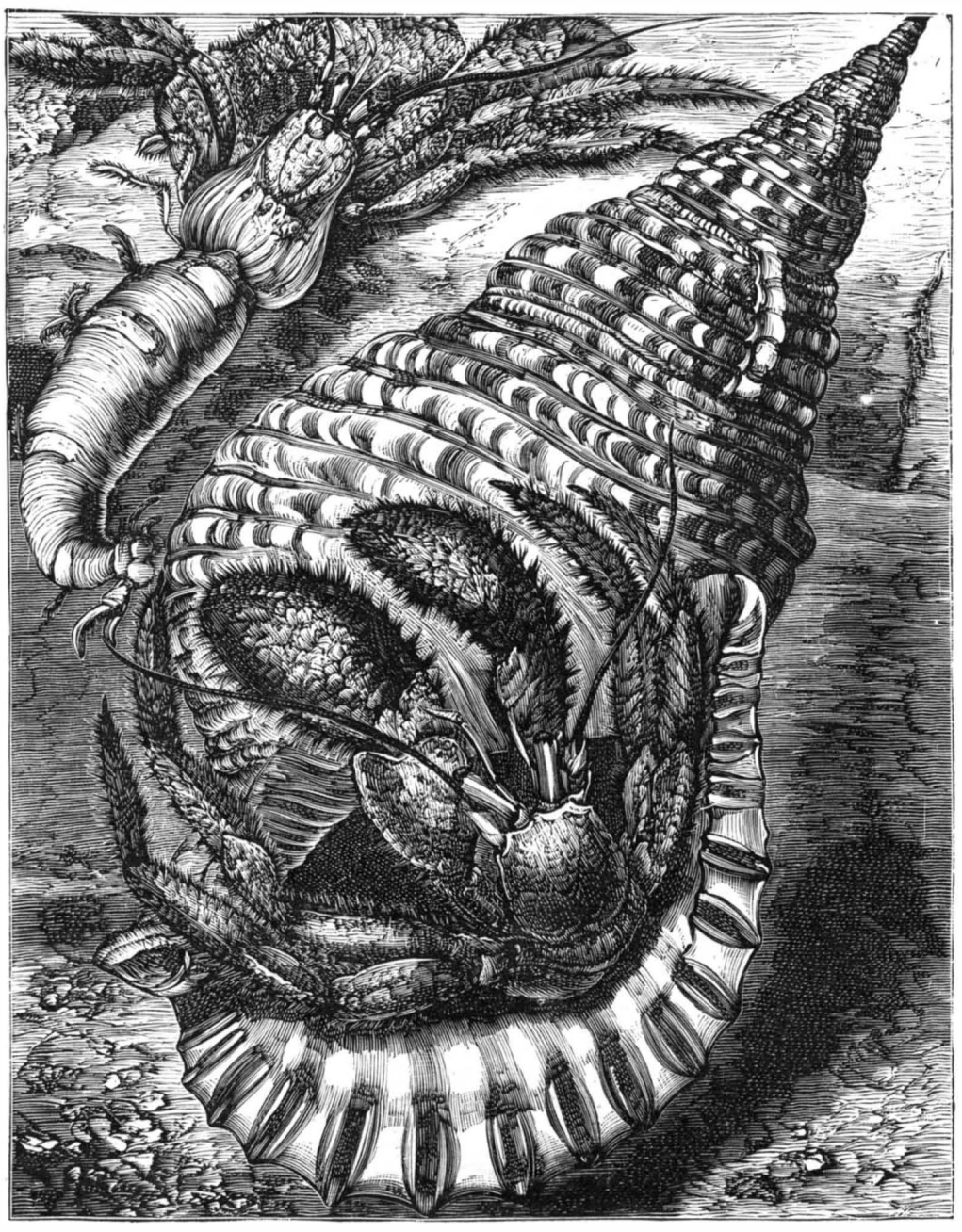
of little rods articulated one to another, and extending around the hair. Some of these rods appear to blend with the proper substance of the nodosity, others terminated at some distance, either by an ampulliform swelling or umbellate extremity. It is difficult to say whether these rods are the mycelium of the fungus which forms the cellular mass of the nodules, or whether they are independent of the latter. Nowhere in the substance of the hair could any trace of a vegetable parasite be discovered after the action of liquor of potassa or acetic acid. The interior of the nodules was composed of a cellular stroma similar to that covering the periphery, and on it were some large cavities containing one or two large colorless cells. A writer in the same journal of a subsequent date says that he has a patient suffering from this rare disease in England. He believes it to be the disease described by Hebra as *tricoresis nodosa*. He states that it is not infectious, and that this fact, combined with its resistance to every method of treatment and his inability to discover any trace of a fungus, has led him to abandon all theories of its fungoid origin.

THE CRAFTY HERMIT CRAB.

There are many species of hermit crabs, those of the tropics being the largest and handsomest. This odd creature inhabits the shell of some mollusk in which it can bury its unprotected tail and into which it can retreat when threatened with danger It usurps the deserted home of various mollusks, according to its size When young and small it is found in the shells of the tops, periwinkles, and other small mollusks; and when it reaches full age it takes possession of the whelk shell and entirely fills the cavity.

The crafty hermit crab is found in the Mediterranean, and, among other shells which it inhabits, the variegated triton is known to be a favorite. In the illustration, which we take from Wood's "Natural History," the crabs are supposed to have fought for the shell, and the vanquished is seen on the ledge above, whither it has been flung by the conqueror.



THE CRAFTY HERMIT CRAB.

Heredity.

At the last session of the National Association, in this city, October 8, Professor Alpheus Hyatt, Custodian of the Boston Society of Natural History, announced that the Massachusetts Board of Health had undertaken to investigate the laws of heredity, and was about to make extensive circular inquiries in that department of research. One idea is to trace in direct and indirect lines all hereditary personal peculiarities, large size of nose, peculiar shape of ears, and features of that sort. It is thought by sending out blanks in this country and abroad, many replies will be received. These blanks provide for a collection of statistics upon which can be based an investigation of the laws governing the inheritance of pathological conditions, abnormal characteristics, and any marked family peculiarities. It is also desired to determine the age at which these conditions appeared in ancestor or parent, and the age at which they became perceptible in the descendants or children. Some characteristics remain unchanged in their mode of appearance through many generations, while others vary constantly, sometimes with a periodicity which implies some regularly recurring cause, and sometimes with a very confusing irregularity. It has been observed that normal or abnormal characteristics show a decided tendency to appear in descendants at an earlier age than that at which they first showed themselves in the ancestor or parent. If the answers are sufficiently numerous, the results when tabulated ought to be of value also in the history and classification of hereditary diseases. The Board will furnish these blanks to all who will use them, and they are to be returned to Professor Hyatt.

Scientific Reliance on Soap.

Dr. Richardson lectured recently in this city on the germ theory of disease. He acknowledged his obligation to Tyndall for his microscopic investigation on air dust, spores, and other comforting and salutary topics. It is worth while for common people to learn that 50,000 typhus germs will thrive in the circumference of a pin head or a visible globule. It is worth while for them to note that these germs may be desiccated and be borne, like thistle seeds, everywhere, and, like demoniacal possessions, may jump noiselessly down any throat. But there are certain things spores cannot stand, according to the latest ascertained results of science. A water temperature of 120° boils them to death, and soap chemically poisons them. Here sanitary and microscopic science come together. Spores thrive in low ground and under low conditions of life. For redemption, fly to hot water and soap, ye who live in danger of malarial poisoning. Hot water is sanitary. Soap is more sanitary. Fight typhus, small-pox, yellow fever, and ague with soap. Soap is a board of health.—*Philadelphia Press.*

Preservation of Food by Gelatine.

The subject of food preservation has recently acquired a new development from Dr. Campbell Morfit's new "Gelatine Process," which has several points of superiority over most of the older plans, the chief of these being the use of a preservative which is itself an article of food. The experience of a good many months has tended to show that food preparations (many of them, such as cabbage, tomato, milk, and meat, of a perishable nature), when prepared with gelatine, and dried so as not to contain more than 10 or 12 per cent of moisture, do not become mouldy even when exposed to warm and moist air. A good idea of the nature of Dr. Morfit's invention may be obtained from the following method of preserving milk:

One pound of gelatine is dissolved in one gallon of milk at a temperature of 130° to 140° Fah., and the solution allowed to set into a jelly; the latter is then sliced and dried. By using these slices for gelatinizing a second gallon of milk, a jelly is obtained in which the milk solids are just doubled in amount. The process is repeated until the original pound of gelatine is incorporated with the solids of ten gallons of milk. One application of this process, which is theoretically excellent, is the dissolving of gelatine in lime juice, adding sugar, incorporating the mixture with powdered navy biscuits and pressing in moulds, thus affording lime juice in a portable form. This preparation has become an article of commerce. The range of materials to which the gelatine process is applicable is a wide one; according to all accounts Dr. Morfit's invention has already been successfully applied in several directions, and seems to be full of promise for the future. The "Thao," or seaweed jelly, is well known to possess remarkable preservative properties, and might perhaps, in some cases at least, serve as a substitute for the animal gelatine.

To Turn Oak Black.

The *Revue Industrielle* states that oak may be dyed black, and made to resemble ebony, by the following means. Immerse the wood for forty-eight hours in a hot saturated solution of alum, and then brush it over with a logwood decoction, as follows: Boil one part of best logwood with ten parts of water, filter through linen, and evaporate at a gentle heat until the volume is reduced one half. To every quart of this add from 10 to 15 drops of a saturated neutral solution of indigo. After applying this dye to the wood, rub the latter with a saturated and filtered solution of verdigris in hot concentrated acetic acid, and repeat the operation until a black of the desired intensity is obtained. Oak stained in this manner is said to be a close as well as a splendid imitation of ebony.

Pearl Millet.

Pearl millet has been cultivated for some years as a forage plant in some of the Southern States, as "African cane," "Egyptian millet," "Japan millet," and in some places as "horse millet," but little was known of it at the North before last year, and then only in such small quantities as to hardly allow of a fair trial. From what we saw of it in 1877 we determined to give it a thorough trial this season. A piece of good strong loamy ground was prepared as if for a beet or turnip crop, by manuring with stable manure at the rate of ten tons to the acre, plowing ten inches deep, and thoroughly harrowing. The millet was then sown in drills eighteen inches apart, at the rate of eight quarts to the acre. We sowed on the 15th of May, about the date that we plant corn; in twelve days the plants were up so that a cultivator could be run between the rows, after which no further culture was necessary, for the growth became so rapid and luxuriant as to crowd down every weed that attempted to get a foothold. The first cutting was made July 1—forty-five days after sowing; it was then seven feet high, covering the whole ground, and the crop, cut three inches above the ground, weighed, green, at the rate of thirty tons per acre; this, when dried, gave six and a half tons per acre as hay. After cutting, a second growth started and was cut August 15—forty-five days from the time of the first cutting; its height was nine feet. It weighed this time, at the rate of fifty-five tons to the acre, green, and eight tons dried. The third crop started as rapidly as the second, but the cool September nights lessened its tropical luxuriance, so that this crop, which was cut on October 1, only weighed ten tons green and one and a half dried. The growth was simply enormous, thus: First crop, in forty-five days, gave thirty tons green, or six and a half tons dry; second crop, in forty-five days, gave fifty-five tons green, or eight tons dry; third crop, in forty five days, gave ten tons green, or one ton and a half dry. The aggregate weight was ninety-five tons of green fodder in one hundred and thirty-five days from date of sowing, and sixteen tons when dried to hay. This exceeds the clover meadows of Mid-Lothian, which, when irrigated by the sewerage from the city of Edinburgh, and cut every four weeks, gave an aggregate of seventy-five tons of green clover per acre. There is little doubt pearl millet is equally as nutritious as corn fodder, which it resembles even more than it does any of the other millets. We found that all our horses and cattle ate it greedily, whether green or dry. If sowing in drills is not practicable it may be sown broadcast, using double the quantity of seed, say 16 quarts per acre. The ground should be smoothed by the harrow, and again lightly harrowed after sowing; if rolled after harrowing, all the better. I know of no farm crop that will better repay high manuring, but so great is its luxuriance that it will produce a better crop without manure than any other plant I know of. In those parts of the Southern States where hay cannot be raised, this is a substitute of the easiest culture, and being of tropical origin, it will luxuriate in their long hot summers; even though our Northern seasons may be too short to mature the seeds, our experiments in New Jersey this summer show what abundant crops may be expected if the similar conditions are secured. Pearl millet as a fodder plant presents a new feature in our agriculture, and I feel sure that within ten years we shall wonder how we ever got on without it.—*Peter Henderson in the American Agriculturist.*

Dairy and Poultry Produce in America.

At the annual meeting of the National Butter, Cheese, and Egg Association, at Chicago, the secretary called attention to the fact that the dairy product exceeds in value the entire wheat crop of America. The whole number of cows in the United States is 12,000,000; average value, $40; total

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value, $480,000,000. The value of their sustenance is estimated at $720,000,000. The value of the entire cheese product of the United States is set down at $36,000,000, and the value of the whole make of butter for 1877 at $175,000,000. To these sums must be added the value of milk condensed for export and that used in families. The quantity of cheese made the past year exceeds that of any other year in the history of the American dairy. It amounted to 300,000,000 lbs. The exports for 1877 were 107,364,666 lbs. England took about 90 per cent., or 95,871,370 lbs., valued at $11,303,185; Scotland took 9,069,693 lbs. The exports of butter in 1877 were 21,527,242 lbs., value, $4,424,616, showing a falling of from 1865, which was 21,388,185 lbs., value, $7,234,173. In 1863 it reached 35,172,415 lbs., value, $6,733,743.

There were received in the city of New York alone, in 1877, 530,000 barrels of eggs, valued at $9,000,000. Allowing that city to use eggs in proportion to its population, the entire consumption of the United States would be 10,600,000 barrels, which, at New York prices, would be $180,000,000.

In 1877 over 34,000,000 lbs. of poultry were consumed in New York, including Brooklyn and Jersey City. At this proportion, 680,000,000 lbs. of poultry were consumed in the Union in that year. The total estimated value of the milk, cream, butter, cheese, eggs, and poultry was $848,000,000.

Australian Gum Trees.

A correspondent in the London *Graphic* gives the following account of the variety of gum trees found in Australia and the uses to which they are adapted:

One of the Australian gum trees (*Eucalyptus globulus*) has been largely planted in North Africa and South Europe as a remedy for malaria. Through its agency the ruin dotted Campagna, some say, is once more to be thickly peopled. The purifying influence steams from the leaves, being one of the volatile oils which make the air of the Australian bush so deliciously fragrant to the camped out traveler, awakened to see the sun rise by the harsh and saucy sounding cackle of the laughing jackass; but which, when the sun has attained his full strength, give to the atmosphere, where the scrub stands thick, somewhat of the oppressiveness of excessive incense.

The eucalyptus which has found favor with European planters is the blue gum, so called from the color of its leaves, but four stand above it in the list of richness as oil yielders.

First stands the dandenong, or narrow leaved peppermint (*E. amygdalina*), a tree which is known to have attained the height of 420 feet. Another measured eucalyptus was as high as the Great Pyramid; and it is supposed there are even loftier trees of the kind. Before these Titans were discovered the greatest tree giant known in Australia was a Karri, 400 feet high, within whose hollow trunk three mounted men with a led horse could turn. It would seem, then, that even California pines are overtopped by Australian gum trees; and after such figures "as tall as the monument" sounds somewhat like "as big as a shrimp." As a timber tree, the peppermint is chiefly useful for the construction of the gray railed fences with slip panels which form so characteristic a feature of the landscape in settled and semi-settled Australia—a poor substitute, in a picturesque point of view, for our variously luxuriant hedges, which, I believe, have been reproduced in Tasmania. Coarse paper might be made from the inner bark of the peppermint; its bark, generally, contains 20 per cent of tannic acid; and it exudes a gum resin.

Next comes the mallee tree (*Eucalyptus oleosa*), a small tree covering thousands of acres of what is called from it Mallee scrub. It may be called a vegetable camel; its roots retaining so much water that travelers through the wilderness rip them up for refreshment.

The ironbark (*E. siderozylon*) stands third. Its name explains itself. It might be called the rhinoceros of timber trees. The wood which its rugged bark covers is close grained, greasy, and almost imperishable; and accordingly is used in ship building, and for cog wheels, spokes, shafts, and poles.

The white gum (*E. goniocalyx*), which follows, is another giant, utilized by builders and sometimes by coopers. Packing paper can be made from its bark, which yields about 18 per cent of potash; its wood about 20 per cent.

Bloodwood (*E. corymbosa*) exactly ties blue gum as an oil producer, each yielding 12·50 per cent. Its bark makes strong wrapping paper. Its wood is red (as might be inferred from the name), and of a good grain, but so thickly veined with resin that it is chiefly used for fuel.

The blue gum runs up to a height of 300 feet, half of the huge bole without a branch. House builders, coach builders, ship builders, and civil engineers make good use of it, and from its bark also paper can be made.

Stringybark (*E. fabrorum* or *obliqua*) is the next in order. It is a huge tree occurring in vast numbers, and although it warps and (dry) rots readily, it is much used for fences and shingles because it splits so easily. The blackfellows make spear strings out of its fiber. Printing paper and pasteboard can be made out of its bark, which is used for roofing bush huts. Messmate (*E. fissilis*) yields a bush carpenter's and wheelwright's wood. The blackfellows use it for spears.

Another peppermint (*E. odorata*), on whose leaves the opossums feast, save for the oil in them is not a very note worthy tree. Woollybut (*E. woollsii*) yields a hard, red, straight grained timber.

The red gum (*E. rostrata*) is the common gum tree of Australia, growing plentifully along the banks of creeks and rivers. It yields a hard, red, curly grained wood, almost as indestructible as that of the Jarrah, or Swan River mahogany, which defies wet, dry rot, and white ants. Its gum is prescribed for chronic diarrhea.

The manna tree (*E. viminalis*) runs from 50 to 120 feet in height. The blacks make canoes and drinking vessels out of its bark, and shields out of its wood. Its leaves in early summer are covered with white manna, which falls like snow when the wind stirs them. Another kind of manna, the secretion of an insect, candies the leaves of a eucalyptus in the mallee scrub. A delicious lemon scented perfume is obtained from the leaves of the *Eucalyptus citriodora*. An Australian town was for some years lighted with gas distilled from gum tree leaves.

There are other eucalypti; among them, the box (*E. leucoxylon*), which yields a timber hard and greasy like the ironbark's; the gray box (*E. dealbata*), very similar in its qualities; the mountain ash (*E. inophloia*), supposed to resemble its European name giver, the mountain white gum tree (*E. Gunnii*), which grows to a greater height on mountains than in plains; the broad leaved box (*E. acmenoides*), and the blackbut (*E. persicifolia*), which yields a timber like the bloodwoods. Altogether, the gum tree has good right to be called the Australian oak, and can far more safely be introduced at random into an Australian picture than a palm tree into an Indian one.

Frauds in Wine Making.

If, as has been said, intelligence was bestowed on man only for the purpose of increasing the number of his resources, it must be confessed that he has shown no want of generosity in his various applications of this gift; and nowhere may this be observed to a better advantage than in those multitudinous and ingenious methods used by him in the sophistication of the articles in common use as food and drink. There is, perhaps, no article of daily consumption that undergoes more and a greater variety of adulterations than wine.

Indeed, not only is it adulterated, but much of the liquid we know by this name is entirely innocent of any grape juice at all. For instance, the sherry for which Hamburg has long enjoyed a notoriety is not sherry but merely a factitious article; yet this when exported to other countries passes for genuine. True port is very rarely seen in the market, most if not all of the stuff sold under that name being mixtures of elderberry juice and other articles; and Madeira is usually composed of sherry variously doctored. It is well known to those living in France, that Nancy bears the odious name of having been the first to set the vicious example of a systematic adulteration of French wines, both red and white; and that Lorraine, Alsace, and Luxembourg are notoriously the center of an extensive manufacture of spurious wines, some of which owe nothing whatever to the vine. Celebrated brands of champagne, as Roederer and Clicquot, are here concocted from rhubarb juice and carbonic acid. Light clarets, rough red Rouissillon, and other wines, can be produced to suit the most fastidious taste, by merely refermenting squeezed grape husks that have once been used, along with coarse sugar made from potatoes.

We can divide the materials serving for the adulteration of wine into six great classes: water, alcohol, sugary matters, astringent or acid matters, coloring matters, and certain ethers designed for giving the bouquet. This subject of the falsification of wines, to properly treat it, would require a volume; we must limit ourselves here to an enumeration of the coloring matters used, the deleterious character of which is not only exciting the attention of French physicians and scientific men, but of the French government as well. The syndicate of Narbonne have formally complained to the Minister of Agriculture that Portuguese, Italian, and Spanish wines, all colored by the juice of elderberries, enter freely into France. Yet the wine growers of the Narbonne district have themselves learned to make use of the elderberry as well as of materials less innocuous. Fuchsine, which is prepared by adding arsenious acid to coal tar aniline, is used in immense quantities for imparting a fine ruby red, although it is admitted on all hands to be poisonous. There are a host of other coloring materials less dangerous than fuchsine, but still injurious to health, in daily use for the manipulation of wines. There is the decoction of campeachy wood, extract of mallow, cochineal, rosaline (one of the coal tar colors), colorine, black mulberry juice, red beet, poppy, and various fantastically named essences of vegetable, mineral, and animal origin. It is said that in July of last year a single grocer of Narbonne sold ten thousand francs' worth of cochineal coloring to wine growers of the village of Odeillan alone, for the artificial tinting of poor and pale wines. M. Paul Massot, the representative of the Eastern Pyrenees in the French Assembly, has become a leader in a crusade for the repression of the new frauds in the manufacture of wines, and has laid before the government a mass of authentic evidence on the subject.

It was proved, for instance, by a careful analysis, that a quart of one certain kind of wine contained no less than half an ounce of alum; and also that the red extract of coal tar, called grenate, which was formerly thrown away as worthless, now commands a high price as an ingredient in the composition of the fuchsine, which is tossed by the hundred weight into wine vats. Happily chemistry has supplied us with the means of detecting these additions, and one of the best, simplest, and readiest methods of doing this we owe to a chemist of Nancy, M. Didelot. The test is merely a tiny ball of gun cotton. This dipped into a glass of the suspected wine, and then washed, will resume its whiteness if the wine be pure; if not, it will retain the red color due to the poisonous fuchsine. The addition of a few drops of ammonia gives a violet or a greenish hue when vegetable matters have been used for imparting the desired color. Other and more complicated tests have also been devised; and with the aid of acids, ethers, peroxide of manganese, and chloroform, the frauds of the wine maker have been completely exposed. Benzine forms, with fuchsine and its allies, a red jelly that floats on the surface of the discolored liquor, and by skillfully conducted processes a precipitate, varying in color, can, in every instance, be obtained.

A new industry, which is daily tending to become more and more important, is that of the manufacture of ethers of a complex composition, for the purpose of giving wines particular bouquets. By the addition of a very small quantity of these, new wines may be converted into the semblance of old in a very minutes, or certain poor wines be made to resemble those of famous vintages. Thus we see that science is ever busy in her endeavors to increase the number of products that are necessary to our modern civilization! However, the French government and public seem now to have taken alarm, and it is to be hoped that ere long the adulteration, by means of the poisonous fuchsine at least, will be summarily suppressed.

Improved Copying Pencils.

The pencils so far made to produce marks from which copies could be obtained in an ordinary copying press, had the disadvantage that, consisting of aniline principally, the color of the copy faded very soon. Gustav Schwanhauser has overcome this difficulty by doing away with aniline altogether. He prepares the pencils as follows:

Ten lbs. of the best logwood are boiled repeatedly with 100 lbs. of water, and the decoction so obtained evaporated down to 100 lbs. The liquid is heated to the boiling point, and small quantities of nitrate of the oxide of chromium added, till the bronze colored precipitate formed at first is redissolved in a deep, dark, blue color. The liquid is now evaporated to the consistency of a sirup, and enough of the finest levigated fat clay is added to have 1 part of clay for every 3 or 3½ parts of the extract. To form a good mass to manipulate, a little mucilage of gum tragacanth may be used. It must be observed, that the quantity of nitrate of chromium must be in the right proportion to the extract, as a surplus prevents an easy writing, and a deficiency prevents the easy solubility of the pencil mass for copying purposes. No other sort of chromium will answer the purpose, as they all crystallize, and the crystals formed in the mass will cause the pencil to be rough and brittle. Nitrate of chromium does not crystallize; its combination with the extract of logwood is the most easily soluble and the blackest ink.

The nitrate is prepared as follows: 20 lbs. of chromic alum are dissolved in 200 lbs. of boiling water. To the solution is gradually added a solution of carbonate of sodium of the same strength, till all the hydrated oxide of chromium has been precipitated. After subsidation of the precipitate the supernatant liquid is decanted and the precipitate washed with distilled water, till the filtrate does not contain any more traces of sulphate of kalium and sodium, as may be shown by the addition of a little solution of chloride of barium. To the precipitate collected on the filter are successively added small portions of heated pure nitric acid, previously diluted by its own volume of distilled water, in such quantity that on boiling a small quantity of the hydrated oxide remains undissolved. In this way a perfectly saturated solution of nitrated oxide of chromium is obtained, containing no excess of nitric acid. This is a great advantage, since an addition of nitric acid to the ink changes its color to a muddy red. Another advantage is, that no basic nitrate is formed, and no excess of hydrated oxide is contained in the produced salt, as it is the case in most all other salts of chromium. Such basic salts form an insoluble compound with the extract of logwood, instead of entering in solution. The writing furnished by these pencils is easily transferable; it is of a penetrating, jet black color. Alkalies and acids are without any effect on the ink.—*Schweizerisches Gewerbeblatt.*

Patent Office Library.

Quite a radical change, according to the *Library Journal*, has been made in the management of the Patent Office library, under Prof. Weston Flint, the new librarian. During the past two years a complete reorganization has been made and a complete catalogue compiled, the first one ever issued, although the present library has been in existence since 1836. A small pamphlet was printed in 1847, when there were but a thousand volumes. The list now amounts to 24,000, not including pamphlets and duplicate specifications of patents of the various countries, and although not large, is considered one of the best technological collections in this country. In addition to completing the catalogue, the librarian has arranged a new system of duplicate foreign patents for the various examiners' rooms, thereby saving a vast amount of time in the tedious labor of examination of claims, and also so arranged that the foreign patents are on file in the library in a few weeks after their publication. A complete subject-matter index of the French patents in English is nearly completed, and an English index to *Dingler's Polytechnisches Journal* will be done by the end of the year.

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Great Machine Tool Makers.

William Fairbairn, the celebrated machinist, has left it on record that, when he commenced his career at the beginning of the century, the human hand performed all the work that was done. In these days such a statement seems very strange, and the wonder is how the craftsmen of the days of our fathers managed to get through the work they did. At the present time, in the vast majority of occupations, we have reversed the old order of things, and machinery may now be said to have superseded the use of the ten fingers in most cases where rapidity and cheapness of manufacture are required. It is said that the first person who invented labor-saving machines was Bramah, the maker of the patent lock. He found it necessary to give the greatest exactness to every part of the ward and key of his celebrated lock. This he found very difficult to do without employing the very best workmen, and their charges were so exorbitant that his invention was in a fair way of dropping out of use on account of expense. In this dilemma he was forced to turn his attention to the introduction of machinery to produce with unerring nicety the different parts of the complicated little apparatus with which his name is yet associated. The workshop in which the many clever contrivances to perform this work with speed were invented may be said to have been the training school for the early machinists, whose labors have, within the present century, built up the mechanical greatness of England. Accuracy of machine work before his day was utterly unknown. Watt had the greatest difficulty in getting his first model of the steam engine constructed with sufficient truth to work; its cylinder was not bored but hammered, and consequently was so imperfect that it leaked in every direction, and when his "old white-iron man" died, he was plunged into despair to obtain another skilled man. Even when he had obtained the trained workmen of the Soho Foundry, they found a difficulty at first in constructing working engines after his design. Maudsley afterward, in conjunction with his partner Field, founded in Lambeth Marsh the famous firm which is still carried on under their names. This firm has done much toward training the splendid machinists which have made English work so famous throughout the world. Clements was another inventor who learned his art in the school of Bramah, and afterward worked for Maudsley & Field. This clever machinist invented the planing machine, without which no perfect plane can be made. The value of such a machine is incalculable. Indeed upon the truth of the plane depends the whole value of modern machinery. Of old, by chipping and filing, an attempt to approach the plane was made, but of course perfect accuracy was out of the question. The fame Clements acquired by his planing machine directed the attention of Professor Babbage to him when constructing his famous calculating machine. This instrument was, perhaps, the most wonderful specimen of mental labor-saving machine that was ever conceived. Professor Babbage, indeed, only commenced its construction, and before he had proceeded with the working drawings far, we are told that his ideas with respect to its capacity as a calculating machine developed so rapidly that the government became frightened. Certain portions of this curious engine were, however, furnished by Clements, and remain now, we believe, in the South Kensington Museum, as splendid fragments of mental and mechanical labor. But although the English had not the honor of carrying out the idea conceived by one of her sons, yet it did not fall to the ground. The Messrs. Scheutz, of Stockholm, followed it out, and after many years' labor produced a calculating machine, a copy of which was purchased some years since by the British Government, and was subsequently employed in calculating a large volume of life tables, which, we are assured by the authorities of Somerset House, never would have been undertaken had this machine not been in existence. Everything Clements undertook he did effectually. To this day we all of us have experience of this in the steam whistle, which was invented by him. Perhaps a still greater pupil of Maudsley was Nasmyth. This remarkable man was the son of the celebrated artist of that name, consequently he sprang of a cultivated stock. Nevertheless he commenced work in his master's celebrated shop at ten shillings a week, and worked his way up from the bottom to the top of the ladder in his own walk of art. This ingenious man may be said to have been called forth by Brunel's gigantic design for the Great Eastern steamship. It was originally proposed to propel this vessel by the paddle, but the shaft for this purpose would have been so large that no forging tools then in existence would have been able to turn it out. Brunel accordingly appealed for help to Nasmyth, who responded by sending a drawing, by return post, of his famous steam hammer. It was, nevertheless, determined to substitute the screw for the paddle, and the drawing was forgotten. Some years afterward, however, Nasmyth was visiting a celebrated iron foundry in France, and noticing a piece of forged work that he knew could not have been accomplished by the ordinary means, was curious enough to inquire how it had been produced. The answer was, "Why, with your steam hammer, to be sure." The Frenchman had been shown the drawing, and rightly estimating its value, he had one made.

Large designs call forth large tools, and large tools, in their turn, call forth large designs. Had it not been for Nasmyth's hammer there would have been no such things as ironclads, neither would there have been any of the monster cannon built upon the coil system, as they are at present. The steam hammer enables us to undertake Cyclopean tasks which we should never have dreamed of otherwise.

The last and best known machinist of the goodly band that issued from the establishment of Messrs. Maudsley & Field is Joseph Whitworth. This celebrated iron worker improved upon Clements' planing machine, in his "Jim Crow" Planer. This machine works with a cutter which reverses itself, cutting backward and forward without losing any time. It was at work, it will be remembered, in the Industrial Exhibition of 1862. Whitworth is, perhaps, best known by his rifle gun, the rifling of which is the very perfection of art. Accuracy of work, learned by him from the traditions of the shop in which he was taught, led Whitworth to contrive various machines for the furtherance of that object. He has invented one machine which detects variations of a millionth of an inch. If the reader wishes to measure the difference between the old work and the machine work of the present day, he has only to look down the hold of any small steamer at one of Penn's marine engines, or to behold the splendid specimen on board the Warrior ironclad. This engine was designed also by the Messrs. Penn; and the perfection of its workmanship may be estimated by the fact that when its five thousand pieces were assembled together for the first time, such was the mathematical accuracy of their fit, that as soon as steam was got up, it began to move with the utmost smoothness. Let the reader, we say, compare this splendid piece of work with the old Newcomen engine in the South Kensington Museum, and he will at once see the ages of mechanical genius we have traversed since Watt took the latter in hand, and by patient thought built up out of it the present steam engine. Yet it is not more than a century ago that the machine represented the most powerful motive engine we possessed, and was as fair a specimen of work as the eighteenth century could turn out. Such are the differences that have been brought about by half a dozen able men carrying out the traditions handed down by Henry Maudsley—mere workshop traditions, which now are acted upon throughout Europe wherever the machinist's skill is known.—*Forge and Lathe.*

Removal of Iron Coloring from Liquors.

A correspondent of the London *Chemist and Druggist* asks how to "remove the taste and color of iron from whisky, a piece of iron having unfortunately dropped into a large bulk and spoiled it all." The editor remarks: "We are surprised that the whisky attacked the iron; when of good quality it is not likely to do so. The most effectual way of getting rid of the impurity is redistillation. This would remove every trace of it, and at the same time improve the spirit. If distillation is not feasible, filtration through silicated carbon will perhaps take its place." In regard to the above we may say that, in this country at least, many spirituous liquors (excepting 95 per cent alcohol, which is always kept in glue-lined barrels) are not unfrequently spoiled by the accidental intrusion of iron, such as nails, or by carelessness in leaving them in contact with tinned iron liquor pumps or measures. This, however, does not go to prove the inferior quality of the liquor, the discoloration being due to the following cause. The spirits having been kept for a time in barrels (usually oak) gradually extract more or less tannin from the wood, and hence when a piece of iron is introduced they become more or less inky in appearance, if not in taste. In the case of alcohol of low proof, or what in this country would be termed common corn whisky, redistillation would prove effectual and, as the editor of the *Chemist and Druggist* remarks, serve to "improve the spirit;" but with the finer whiskies and brandies used as beverages, such a proceeding would manifestly prove impracticable, as would filtration through any substance whatever.

The following method, not generally known, will be found an effectual remedy in cases of this kind. If a quantity, say forty gallons, of liquor has been spoiled, take one quart of plaster of Paris, and having incorporated with it sufficient water to make it of the consistency of cream, pour the mixture into the barrel of spirits and mix very thoroughly by agitation. This done, allow the barrel to remain undisturbed for a short period, say a week. At the end of this time it will be found that the plaster of Paris has subsided, carrying down with it all of the inky coloring matter, as well as having removed the chalybeate taste. By this simple and harmless method, the finest liquors, although apparently irretrievably ruined, may be restored to their normal condition.

The Utilization of Iron Slag.

The *Chemical News* notes the exhibition, at the Paris Exhibition, of the products of a new industry in connection with the utilization of slag from iron blast furnaces. Before a method was discovered of converting this substance into what is known as "mineral wool," many attempts had been made to utilize this product, which covers so many acres of once fertile ground in the iron districts. As it is, it is generally considered as so much waste; it has been broken up for road paving, or made into blocks for building purposes, but as the product will not pay for its own transport, only a small quantity can be employed, and that only in the neighborhood of iron works. Several persons have tried making glass of it, and have succeeded by adding the constituents that were wanting; but to get the slag to a condition in which the matter can combine, it has to be liquefied by heat, which involves a very great expense. After many experiments, Mr. Britten has succeeded in utilizing the material, and also the heat from the furnaces, and an English company has been formed to work his patent. The company has erected glass works in Northamptonshire, close to a set of blast furnaces, and they are now in operation. The slag flows into a tank at one end, and is there mixed with the required ingredients for making the glass, fused, and fined; the melted metal then flows through a bridge to the other end of the tank, where it is worked, and afterward blown into bottles, etc. As the slag is already melted, it does not require so great a heat for the combination with the other substances, and also it furnishes more than half the material of the glass. Thus this glass costs less than that made by the ordinary method. The natural tint of the product is greenish, but it can be bleached or colored at will. The furnace now at work produces ninety gross of bottles a day. It can readily be seen that it will be cheaper for ironmasters to have glass works attached to their own works, as the cost will not be so much as the always increasing cost of ground to dispose of their slag on.

Relative Cost of Coal Transportation by Water and by Rail.

The increasing importance of the coal importations into London is causing a renewal of the struggle of 1871 between the railroads and steam colliers for the transportation of it.

In their ineffectual attempt in 1871, the roads lost at the rate of £300,000 per annum, and, from testimony given before a Parliamentary Committee, cannot hope to do much better in the threatened contest without the government interference which they seek. The manager of one of the largest coal lines to London states, in his evidence, that "he cannot carry coals any cheaper than from 0·020*d.* to 0·024*d.* per ton per mile," exclusive of trucks, while coal via Boston, by screw collier, costs under 0·006*d.* per ton per mile.

In the face of these figures it is hardly possible that the railroads will ever get the advantage over water transportation, no matter to what extremes they may attempt to urge legislation.

That the matter is worth fighting for, however, is shown by the statistics of the London Supply, which, in 1871, had grown in a few years from 1,000,000 tons to between 6,000,000 and 7,000,000 tons, and is now, in 1878, 9,000,000 tons.

New Agricultural Inventions.

Mr. Nelson E. Allen, of Beaver Dam, Wis., has patented an improved Sheep Rack, from which the unconsumed feed or hay which the stock will not eat may be discharged by tilting one or both of the racks proper. The racks may be so placed as to exclude sheep and other stock from the trough while grain is being placed in it.

An improvement in Cow Milkers has been patented by Mr. Slaughter G. Major, of Haynesville, Mo. It consists in an instrument for insertion in cows' teats, which allows the milk to flow out, thus avoiding the slow and tedious process of forcing the milk out with the hands.

An improved Reciprocating Churn has been patented by Mr. James E. Gibbs, of Scottsborough, Ala. This churn has a double dasher, that is reciprocated by means of an elliptical cam secured to the fly wheel of the driving apparatus.

Mr. James L. Carpenter, of Vineland, N. J., has patented an improved Device for Feeding Young Pigs, Lambs, Goats, and Calves. It consists in the combination, with a box or pen, of a receptacle for milk or other food, placed upon the outside of the pen, and provided with a series of nipples which project through the side of the pen to its interior. A trough is placed beneath the ends of the nipples to catch the drip and teach the animals to drink.

The Medical Ice Hat.

Mr. Spencer Wells, in his lecture on the diagnosis and treatment of abdominal tumors, states that, as a means of lowering temperature in cases when it has risen after ovariotomy, he has tried aconite in small doses, quinine in large doses, salicylic acid in the form of salicylate of soda, in fact almost every medicine that has been suggested as effecting this purpose, but all these trials have ended in disappointment. He has, however, succeeded distinctly in lowering temperature, and in keeping it low by the application of ice or iced water to the head. The first trials were made after a suggestion of Dr. Richardson, by putting an ice bag round the neck. Dr. Richardson believed that by icing blood that went through the carotids to the brain, and blood that came back through the jugulars, we should directly lower the temperature of the brain itself; and probably it may have been done experimentally, but in practice it was not found easy to do. It was difficult to keep any kind of cravat or collar that was tried, filled with ice, round the neck of the patient; it slipped off, and the old India rubber bag or ice helmet, so well known in lunatic asylums, had to be resorted to. After a time Mr. Thornton combined a particular form of cap which answers the purpose extremely well.

A pail of water with a large lump of ice in it is placed above the bed of the patient, and the stream of iced water runs through the cap, which is formed of a coil of India rubber tubing lined with linen. That is placed upon the patient's head, and it is made of different sizes and shapes to fit the patient; the other extremity of the tube is put into a second pail at the side of the bed, and by this means the head is iced. The effect in lowering temperature is very marked, the thermometer in almost all instances indicating a fall of temperature within an hour. If the temperature be rising it is checked, and if very high it can be lowered, and so time is gained for the recovery of the patient.

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GAS A SUBSTITUTE FOR SOLID FUEL.

BY M. H. STRONG.

Improvement in methods of producing and applying heat is rational and businesslike economy, and is to be sought in comparatively few directions. First, the combustible employed must be intrinsically cheap. Second, it must admit of greater ease of handling and rapidity in attaining the maximum temperature than have heretofore been secured. Third, it must possess the capability of cheaper storage and transportation to the point of combustion without waste. Fourth, it must have the susceptibility of more perfect combustion than has yet been attained in the everyday use of ordinary fuel. Any one of the advantages named can scarcely be overrated, and all of them may be secured by the use of water gas as made by recently improved methods.

No well-informed person who gives the subject any thought will claim that the combustion of a given volume of gas, the product of the decomposition of steam by the agency of incandescent carbon, can by any possibility evolve more heat than that generated by the perfect direct combustion of an equal weight of the same carbon. Theoretically there can be no gain whatever by the exchange, and just here the mere theorist would pronounce the matter unworthy of further investigation. The subject, however, is a practical one, and demands an inquiry into the comparative fitness of the two forms of fuel for the various uses to which heat is applied.

It is manifest that the transformation of a crude to a gaseous form of fuel by employing it for the decomposition of steam, permits a wider, more varied, and perfect application of its potential heat energy, and that the measure of its economy is the cost of such transformation. Let us in a general way inquire into this question of cost.

No sooner had the discovery been made that water is composed of oxygen and hydrogen gases, than it became a pet theory (and would have remained a theory to this day had not fact taken its place) that it would sooner or later afford a practical source of cheap heat and light. Many thousands of dollars and much thought and labor have been devoted to attempts at its rapid and economical decomposition, but so persistently did the solution of the problem elude experimenters, that at one time the term water gas became a synonym for hallucination. Chemical reagents and the electric current were in turn faithfully tried and abandoned, as entirely impracticable on the score of economy.

Advantage was then taken of the well known affinity of the oxygen of water for carbon at high temperatures, but unlooked for and apparently insurmountable difficulties of a technical nature interposed to prevent a decided success in that direction, some of which we will mention. The carbon employed, whether of coal, coke, or charcoal, was placed in retorts of clay or iron, set in a furnace and brought to a high temperature by a fire beneath, as in the ordinary distillation of gas coal. Steam was then admitted to the retorts, whereupon the well understood decomposition and recomposition ensued with an evolution of what is termed water gas, composed mostly of hydrogen, carbonic oxide, and carbonic acid gases, the rapidity of the operation being of course in direct proportion to the quantity of carbon and heat employed. This general description will cover nearly all the attempts at water gas manufacture by the agency of carbon up to quite a recent date. In short, experimenters seem to have confined themselves to the system of external heating of retorts. Now let us examine into the defects of the system as heretofore employed, or at least of its indifferent success.

It should be borne in mind that we are not speaking of water gas as a diluent or vehicle to convey rich hydrocarbon gases to the burner for lighting purposes, but solely as a fuel.

First, to impart the necessary heat to the carbon it must be transmitted through a retort, usually made of clay (a decidedly bad conductor), and since the external surface of this retort is small compared with the internal surface of the furnace in which it is placed, but a small fraction of the heat evolved was applied to the carbon itself; add to this loss by conduction through the walls of the furnace the enormous loss of heat due to the imperfect combustion of the fuel, and we recognize the first item of cost.

Second, to maintain the necessary temperature of the carbon for decomposition involved a serious wear and tear of both furnace and retorts.

Third, since speed of manufacture is an element of economy, and since direct contact of the oxygen of the steam with the carbon is absolutely essential to decomposition, we see another item of loss in the fact that although at first the evolution of gas was rapid it soon ceased because contact ceased. This will be explained by stating that the process of decomposition forms a coating of ash over each individual lump or piece of carbon, which soon becomes so protected by the oxidation that much of the steam escapes decomposition, while constantly absorbing useful heat to no useful purpose.

Another and by no means the least item of cost is found in the large volume of carbonic dioxide formed, especially in the lower ranges of temperature. With no method devised for conversion to CO, its action was not simply a diluent, but a directly antagonistic one to the calorific power of the combustible portion. To be sure, this impurity could be removed by lime or other alkaline reagents, involving, however, an expense almost prohibitory. Last, but not least, was the cost of labor in the charging and discharging of retorts and the stoking of fires.

These disadvantages and drawbacks incident to, in fact inherent in, the system of external heating always have worked and always will work its defeat, if economy be the object sought.

On the principle, however, that with perseverance defeat leads to success, the money, time, and labor have been well spent. By the new system water gas is produced at a cost which guarantees a gratifying improvement over the present wasteful method of generating heat, not alone in the arts and manufactures, but in domestic use.

Reserving for another article the attempt to show the great advantage to be derived in the use of gaseous fuel over the solid form, we will content ourselves in this by endeavoring to point out in a general way, without referring to details of construction, wherein the new method of producing water gas avoids the difficulties encountered in the old.

First, it abandons the external for the internal system of heating, thus effecting a great saving of fuel. Second, it employs the very cheapest form of carbon, that of dust or slack, the use of which is impracticable in the old. Third, the products of imperfect combustion are utilized for the heating of steam, whereas in the old system they were wasted. Fourth, the oxygen of the steam being thus intensely superheated is applied to the carbon in a state of minute subdivision and while in suspension, thereby securing direct and intimate contact of these elements, and as a result astonishingly rapid and thorough decomposition. Fifth, the CO_2 portion of the gas formed by this contact is thoroughly converted to CO by passing through a bed of incandescent carbon before its exit from the generator, by which two very important advantages are gained, to wit, avoiding the labor and cost of purification, and an exchange of one volume of the non-combustible CO_2 for two volumes of the highly combustible CO. Sixth, the great saving in labor and wear and tear.

It must be admitted that these differences are radical, and that they indicate improvement in a wide field of operations.

Ventilation of Bedrooms.

The ventilation of bedrooms, a very important matter, is, as a rule, much neglected. The circulation of the blood is not nearly so active during sleep as when awake. The *Lancet* has some important notes on this subject. The sleeper is entirely dependent upon the atmosphere supplied to him for the means of carrying on the chemical purification and nutrition of his body. He must breathe the air that surrounds him, and he does this for a lengthy portion of each period of twenty-four hours, although it is probable that in a large majority of cases the atmosphere has become so deteriorated by the expiration of carbon and the emanations from the body generally, that if the senses were on the alert some change would be sought as a mere matter of preference.

When a person places himself in a condition to take in all air, without being able to exercise any control over its delivery, he ought to make sure that the supply will be adequate, not merely for the maintenance of life, but for the preservation of health. If a man were to deliberately shut himself for some six or eight hours daily in a close room, with closed doors and windows (the doors not being opened even to change the air during the period of incarceration), and were then to complain of headache and debility, he would be justly told that his own want of intelligent foresight was the cause of his suffering. Nevertheless, this is what the great mass of people do every night of their lives with no thought of their imprudence. There are few bedrooms in which it is perfectly safe to pass the night without something more than ordinary precautions to secure an inflow of fresh air. Every sleeping apartment should, of course, have a fireplace with an open chimney, and in cold weather it is well if the grate contains a small fire, at least enough to create an upcast current and carry off the vitiated air of the room. In all such cases, however, when a fire is used, it is necessary to see that the air drawn into the room comes from the outside of the house. By a facile mistake it is possible to place the occupant of a bedroom with a fire in a closed house in a direct current of foul air drawn from all parts of the establishment. Summer and winter, with or without the use of fires, it is well to have a pure ingress for pure air. This should be the ventilator's first concern. Foul air will find an exit if pure air is admitted in sufficient quantity, but it is not certain pure air will be drawn in if the impure is drawn away. So far as sleeping rooms are concerned, it is wise to let in air from without. The aim must be to accomplish the object without causing a great fall of temperature or a draught. The windows may be drawn down an inch or two at the top with advantage, and a fold of muslin will form a "ventilator" to take off the feeling of draught. This, with an open fireplace, will generally suffice, and produce no unpleasant consequences even when the weather is cold. It is, however, essential that the air outside should be pure. Little is likely to be gained by letting in a fog or even a town mist.

The Filtration of Drinking Water.

Dr. A. B. Prescott remarks, in the Michigan *Medical News:* It seems to me more attention might well be given to the purification of rain water, river water, etc., by that simple means, everywhere and at once cheap and available, the use of a portable filter with a good bed of pulverized charcoal in layers with gravel. I do not disparage filters set in cisterns or reservoirs. If made on right principles they may do the work expected of them. They have an advantage of permanence and uniform supply without daily attention, but they are much more liable to failure from neglect of the true conditions of filtration than the simple movable filters manufactured for sale.

Some of the definitions and conditions of a good water filter may be given as follows:

1. It must be more than a strainer, and remove more than suspended matters. A brick partition (of bricks mortared edge to edge) in the cistern or reservoir makes a good strainer, removing undissolved matters, but not much else.

2. It must remove from the water the dissolved colloids—the organic matters. The power of a bed of powdered charcoal, especially bone charcoal, to withdraw coloring and other colloid matters, is familiar in manufacturing operations.

3. The good water filter, instead of becoming filled with the organic matters it removes, causes their prompt oxidation. To do this it must have air. A filter constantly submerged under water can act only with the attenuated oxygen dissolved by the water, and cannot effect half the oxidation it would if exposed to the air for the greater part of the time. Without oxidation of its gatherings, a filter can render only a brief service.

How to get rid of Ants.

During a recent visit to Mr. Humann, in Ostheim, I had an opportunity of becoming acquainted with a very successful method of speedily getting rid of ants, which are so troublesome in the apiary.

One takes small bottles, fills them half full of sirup or sweetened water, and puts them in the places where the ants have their passage ways, in such manner that the necks of the bottles lean against a wall or board, in order that the ants may easily fall into the trap and drown.

By means of camphor, ants may be driven from rooms where honey is stored.

In gardens, lime dust operates very destructively upon them. Their hills, after being scratched open, are sprinkled with lime dust, and then hot water is poured on them.

To render jars of honey or preserved fruit inaccessible to these insects, place the jars in chests whose bottoms have been previously covered with ashes or pulverized chalk.—*Bienenzuchter.*

The Texas "Screw Worm."

Samuel Myers is now lying bedfast at his home in this place, afflicted with that terrible malady, the screw worm, It appears that Mr. Myers has been sick, of late, with fever, and that recently, while resting in bed, one of the flies alighted near his nostrils, where there were some few drops of blood. It requires but a few moments for one of these flies to deposit hundreds of eggs, which are hatched and grown inside of an hour, many of them as much as one half an inch in length. Mr. Myers, upon awakening, felt a slight tickling in the nose, and it was not until his eyes and face had become fearfully swollen, that the physician discovered the presence of the worms. The only known remedy was applied—calomel and carbolic acid—by injection into the nostrils. At first a few would drop their hold and force themselves out. Application after application was made with like results up to the time of our report, when 152 was the number passed. The patient is in a critical condition, with but slight hopes of his recovery. The fly is much dreaded by our stock men, and is represented as a dark colored and fuzzy insect, which generally attacks cattle or any other animal that is unfortunate enough to have blood upon which it can alight.—*Dallas Intelligencer.*

The Science of Milling.

The problem of milling is to separate in as simple and cheap a manner as possible the interior of the grain from the outer rind, the beard, and the germ; to thoroughly grind the cells of which the grain is composed, and by setting free the glair substances and starch grains from the outer integument in which they are inclosed, to facilitate a quicker and more intimate contact of the nourishing qualities contained in the wheat with the human stomach.

The Austro-Hungarian high milling, with its nicely exact elimination of even the smallest modicum of bran, and its fine and careful grinding, of all other methods approximates the nearest to this ideal, and the bread made of flour so treated is consequently the most nourishing and the easiest of digestion of any bread in the world.

According to this theory, if we would answer the practical question, "How much pure flour can be got out of the grain?" the above named experiment will enable us to do it in the following figures: Pure flour—wheat, 78 to 82 per cent; rye, 75 to 80 per cent. Waste and fodder—wheat, 18 to 22 per cent; rye, 20 to 25 per cent.—*G. Pappenheim.*

Cellulose as a Material for Washers.

The *Pharmaceut. Centralhalle* says that, for the purpose of packing joints which are to be hermetically sealed, such as retort connections, couplings, etc., where vulcanized rubber has usually been employed, cellulose appears to be even a better material. It has the advantage of cheapness, it read ily absorbs water at first, thereby becoming pliable, and adapts itself more accurately to the surfaces which it is intended to render tight. If a joint is exposed to steam, and is to be frequently opened, the cellulose should be soaked in oil.

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Interstate and International Mechanical Exchange. Explanatory circular free. A. S. Gear, Manager, 20 E. 13th St., N. Y., U. S. A.

Steam, Water, Gas, Valves, Hydrants. Prices reduced. Send for catalogue. Chapman Valve M'f. Co., Boston.

The Goddard Emery Wheel. Best, strongest, and cheapest. Satisfaction guaranteed. E. A. Goddard, General Sales Agent, also dealer in Machinists' Supplies, 176 Fulton St., N. Y. city. Send for catalogue.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are to be sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

For the best advertising at lowest prices in Scientific, Mechanical, and other Newspapers, write to E. N. Freshman & Bros., Advertising Agents, 186 W. 4th St., Cin., O.

For Town and Village use, comb'd Hand Fire Engine & Hose Carriage, $350. Forsaith & Co., Manchester, N. H.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

The Lawrence Engine is the best. See ad. page 349.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Brick Presses for Fire and Red Brick. Factory, 309 S. 5th St., Philadelphia, Pa. S. P. Miller & Son.

Punching Presses, Drop Hammers, and Dies for working Metals, etc. The Stiles & Parker Press Co., Middletown, Conn.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Wanted.—Articles to manuf. D. J. Miller, Mohawk, N.Y.

Fine Gray Iron Castings a specialty, also Wire Workers' Pickets and Rosetts in stock. A. Winterburn's Foundry, 16 De Witt St., Albany, N. Y.

Bolt Forging Machine & Power Hammers a specialty. Send for circulars. Forsaith & Co., Manchester, N. H.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Books for Engineers and Machinists. Catalogues free. E. & F. N. Spon, 446 Broome St., N. Y.

Northrop's Sheet Iron Roofing makes most durable fireproof roof. Used on all kinds of buildings. Send for circular and prices. Northrop & Co., Pittsburgh, Pa.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J. English Agency, 18 Caroline St., Birmingham.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

H. Prentiss & Co., 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates. Reamers, etc. Send for list.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills. Pittsburgh, Pa., for lithograph, etc.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

North's Lathe Dog. 347 N. 4th St., Philadelphia, Pa.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See advertisement.

Wheel Press, Cotton Press, Pipe Line, and Test Mercury Gauges. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

Best Wood Cutting Machinery, of the latest improved kinds, eminently superior, manufactured by Bentel, Margedant & Co., Hamilton, Ohio, at lowest prices.

We make steel castings from ¼ to 10,000 lbs. weight, 3 times as strong as cast iron. 12,000 Crank Shafts of this steel now running and proved superior to wrought iron. Circulars and price list free. Address Chester Steel Castings Co., Evelina St., Philadelphia, Pa.

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., N. Y.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Holly System of Water Supply and Fire Protection for Cities and Villages, is fully described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 140.

Diamond Self-clamp Paper Cutter and Bookbinders' Machinery. Howard Iron Works, Buffalo, N. Y.

Cutters shaped entirely by machinery for cutting teeth of gear wheels. Pratt & Whitney Co., Hartford, Conn.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N.Y., U.S.A.

The Turbine Wheel made by Risdon & Co., Mt. Holly, N.J., gave the best results at Centennial test.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St. Wm. Sellers & Co.

NEW BOOKS AND PUBLICATIONS.

WRINKLES AND RECIPES. New York: John Wiley & Sons, 15 Astor Place.

Another new edition (the thirteenth) of this useful handbook, enlarged and improved, has just been issued by the above well known importing and publishing firm. To the new edition has been added a number of useful recipes, a few pages illustrating and descriptive of the phonograph, microphone, telephone, and electric light, the latter subjects of special interest at the present time. But the most important addition is the introduction of a color tempering scale, illustrating a new and ingenious method which has been patented, showing by gradation of shading the precise color tools of every variety should be kept up to, to produce a right temper. The object of the inventor and author of this chart is not only to teach apprentices and other inexperienced persons the art of tempering, but to make it an exact standard for all metal workers. This work as now revised and improved, with the addition of the new tempering chart, renders it a desirable companion for the mechanic and artisan, and not less useful in the household.

BOLETIN DE LA SOCIEDAD DE GEOGRAFICA Y *Estadistica de la Republica Mexicana.* Tomo IV., No. 1. 1878.

The Geographical and Statistical Society of the Republic of Mexico was established by an act of the Congress of the Union in 1851. Its meetings are held every Saturday evening in the hospital of Terceros (where also are its museum and library), in the city of Mexico. The "Bulletin," now in its seventeenth volume, is the official organ of the corporation, and is not only designed as a permanent record of the Society's proceedings, but also as a medium through which information concerning all matters that pertain to the prosperity of Mexico may be promulgated so cheaply as to place it within the reach of all classes of people. This being the patriotic object of the Society, it is very unfortunate that, owing to a want of harmony between it and the then Minister of Agriculture, and the revolutionary state of the country, it was obliged to suspend the publication of the "Bulletin" at the beginning of 1876, and not able to resume it again until the present year. In the initial number of the new volume, which we have just received, the editor says: "Fortunately this third interruption that our Bulletin has suffered during the long existence of the Society has ceased, and we will commence our task anew, confident that we will, as ever, be honored by public attention in our own country, and that foreign societies will continue kindly to exchange with us. The members of the Society, devoting themselves to the study of the numerous questions that are embraced in the extended scientific programme of our institution, have given by preference more especial attention to those that relate to the interests of our country. In the interim a great mass of material has accumulated, which will hereafter be published regularly, and that which was already in press will form the first fasciculus of the present Volume IV. of our third series." This number contains the Proceedings of the Society for April, 1875; Notice of the International Congress of Geographical Sciences (Paris 1875 Statistical Notes regarding the Municipality of Ameca de Jalisco, Mexico; "El Torito," a beautiful orchidaceous flower; Memoir on a Meteor observed at Oaxaca, in 1874; The Native Navigators of the time of the Conquest; Statistical Notes on the State of San Luis Potosi; Letter from Associate Member Boguslawski to the Secretary We congratulate the Society on the typographical appearance of its Bulletin, which will compare favorably with like publications issued in more favored climes; the typography is a model of good taste, the American paper (*magnifico papel Americano*, as the editor calls it) is of good quality, and the whole make up of the publication is of a character that any American or European society might be proud of. We wish the Society success in this, the beginning of its third like undertaking.

EL PORVENIR. *Periodico Quincenal de Literura, Ciencias y Artes.* Guatemala. 1878.

Among other esteemed exchanges from our sister republics of Central America, we are in regular receipt of *El Porvenir* ("The Future"), the organ of a literary society of the same name in the city of Guatemala. This periodical, of 16 pages, has now reached the 31st number of its second volume. Every issue is filled with literary, art and scientific matters of great interest, the perusal of which cannot fail to be a source of the greatest pleasure and instruction to the citizens, old and young, of the beautiful capital city of the republic. We wish the periodical, as well as the society under whose auspices it is issued, a long life of prosperity and usefulness.

LA AGRICULTURA VALENCIANA. *Revista Mensual de la Sociedad de Agricultura de Valencia.* Spain. Vol. XV., No. 1. 1878.

Undoubtedly one of the best means of lifting the agricultural population of any country out of the rut in which its forefathers moved, and which it instinctively adheres to more persistently than do the members of any other branch of human industry, is the dissemination of useful information through the medium of well conducted agricultural journals or the publications of agricultural societies. In our own country, where education is so universally diffused, and the masses so well educated, agriculture has long been pursued in a somewhat scientific manner, and there can be found few farmers, even those in the humblest circumstances, who do not keep informed in regard to the latest improvements in implements relating to their occupation, and who do not manage to obtain them and avail themselves of the advantages proceeding from their use. In those countries less favored than ours in this respect, where farming utensils of the most primitive character are still employed, and where agriculturists yet adhere to the traditions of their forefathers with an obstinacy worthy of a better cause, the association of well informed men into societies for the promulgation of advanced and practical ideas cannot fail in time to have a beneficial effect in ameliorating the condition of the agricultural class, thereby promoting the prosperity of the country. We are pleased to note the existence of several such societies in the Spanish-speaking States of Central and South America, and are gratified to learn from the bulletin which they issue that they are apparently meeting with much success in promoting the adoption of new and scientific methods in the practice of farming. In Spain, too, considerable attention is being paid to agricultural matters, as we judge from the exchanges which we receive from that country. Among these publications we wish, at the present time, to speak more particularly of one whose title heads this notice, inasmuch as it is the official organ of one of the most flourishing institutions of the kind in Spain—the Agricultural Society of Valencia. In the first number of the fifteenth volume, lately received by us, we find a great deal of interesting matter that might well be read with profit by agriculturists of other countries than the one for which it was written. The scientific articles are well written, and show that the authors keep pace with the latest discoveries of the times. The contents of this number are: (1) Editorials; (2) On the bringing to light of Subterranean waters; (3) Agriculture and Botany in Valencia; (4) Inauguration of the Agricultural Station in the Garden of Acclimatization, under the auspices of the Valencian Society of Agriculture; and (5) The Atmosphere in its relation to Agriculture and the forecasting of the weather. This publication is a large octavo of 32 pages, beautifully printed on a fine quality of paper with wide margins, occasionally illustrated, and is issued by the Society every month. We trust that the succeeding volumes of the second series, which the present number begins, will meet with the same success that has attended those of the past fifteen years.

LA EMULACION. No. 13. *Merida de Yucatan.* 1878.

This interesting little periodical, now in its third volume, is the organ of the Medico-Pharmaceutical Society of the flourishing city of Merida, the capital of Yucatan. Although the paging of the number before us is somewhat peculiar, due no doubt to its being the organ of two professions, and although the arrangement of the matter betrays its foreign origin, yet in general typographical appearance it will compare favorably with many of our American periodicals. The present number contains (1) an article calling attention to the need that Merida has of some competent physician to be consulted in medico-legal cases, as well as of city physicians for the poor; (2) On a new application of the Esmarch Bandage; (3) Botanical Calendar of Merida and vicinity; (4) A Case of Hydrophobia and successful cure; (5, 6, and 7), articles on "Cabalsit," "Chucchik," and "Sida Crispa," plants with remedial virtues; (8) Notes from exchanges. Merida, with its colleges of medicine and pharmacy, and such an exponent of the two professions as this, ought certainly to be a healthy city.

LAS CLASES PRODUCTORAS, *Organo de la Sociedad de este Nombre.* Guadalajara, Mexico. EL PABELLON MEXICANO, *Periodico Religioso, Politico, Cientifico, Literario,* etc. Guadalajara, Mexico.

Among other exchanges printed in the Spanish language, we have to acknowledge the regular receipt of the two named at the head of this notice, both published at Guadalajara, the second city of importance in Mexico The former of these two papers is the organ of a society of progress whose motto is "Intelligence, Capital, Labor," and whose programme embraces the establishment of banks; mutual security of life and property; mutual aid; railroads and roadways; telegraphs; privileges to inventors; scientific publications and a host of other like objects. The society is extremely liberal in its religious views, asking no one to make a profession of his creed for admission, but receiving all honorable men who, desiring the public good, wish to associate together to promote this object. The society carries on, in addition to its other good works, both a night and a day school, which from the published curriculum appear to be capable of giving the pupil a thorough education in all the useful branches of knowledge. The periodical published under its auspices is devoted mainly to instruction; the number before us, for instance, containing, in addition to an editorial: (1) "Object Teaching—Stone;" (2) "History of a loaf of Sugar—The sugar talks about Botany;" (3) Instructive paragraphs. The other paper (*El Pabellon*) is conservative, and strongly devoted to the church; its motto being, "The religion of new Spain is and shall be Catholic, Apostolic, Roman, tolerating no other." As we might expect of two periodicals holding such diverse views, we find our two esteemed contemporaries, in our latest files, engaged in a controversy over religion. The editor of *El Pabellon* remarks of his brother editor of the *Clases Productoras:* "We highly appreciate Senor Matute for his unspotted honor, and for the purity and rectitude of his intentions, but we distrust his ideas in regard to free communication with infidels and heretics: they are not those of the Catholic Church. She has always forbidden her sons to mingle and communicate with those who are infected with the prevalent epidemic heresies. This has been her practice from apostolic times, making use of excommunication on the one hand, and of anathemas on the other; and this is the way we understand the sublime precept of the Master: 'Love ye one another'" (!) Wars of religion never lead to any good, and we trust when our next files of *El Pabellon* and *Las Clases Productoras* reach us, that the editors will have ceased to dip their pens in gall, and that each will have determined to hereafter conduct his journal according to the policy marked out for it—policies each of them excellent in its way.

Notes & Queries

(1) O. B. asks: Will you name a good work on the fabrication of soap? A. Dussauce's "Practical Treatise on the Fabrication of Soap and Candles."

(2) C. M. D. writes that porous cups for a battery may be made by forming a paper mould and covering it, by means of a brush, with a mixture of plaster of Paris, repeating the application until the required thickness is obtained. The paper mould will be destroyed by the acid.

(3) W. P. T. asks: What preparation can I coat paper with to render it impervious to oil? A. Try thin glue size.

(4) F. R. asks: 1. Would lampblack pressed into moulds answer for the carbon in the Bunsen battery? A. No. 2. How is the gravity battery made? A. Solder the clean end of a piece of gutta percha covered copper wire to a plate of copper, which place in the bottom of a glass jar of suitable size; cover this with a few crystals of copper sulphate, and nearly fill the jar with water containing an ounce per quart of zinc sulphate. Then suspend a piece of clean zinc at the surface of the solution. Electricity will pass through a wire from the copper to the zinc. A few hours on closed circuit will develop the full strength of the battery.

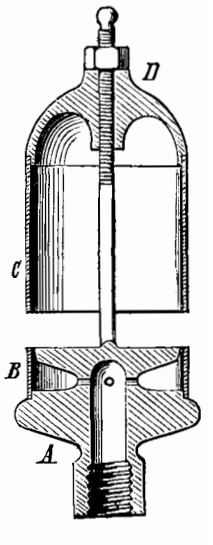
What is phosphide of calcium, and how is it made? A. Calcium phosphide is prepared by passing vapor of phosphorus over fragments of lime heated to redness in a porcelain crucible. The chocolate-brown product yields spontaneously inflammable hydrogen phosphide when thrown upon water. Its formula is Ca P.

(5) C. E. S. and others.—We intend publishing at an early date in the SCIENTIFIC AMERICAN or SUPPLEMENT full directions for making an induction coil.

(6) M. & S.—The incrustation consists chiefly of lime carbonate and fine argillaceous sand. Frequent blowing out is one of the best preventives.

(7) W. H. G. writes: My marble top table has been injured with lemon juice; marble mantel stained with kerosene oil. How can I restore each to its original beauty? A. Cover the soiled parts with a paste of quick lime moistened with a strong aqueous solution of sal soda for several hours; then remove the paste and wash the parts thoroughly and polish.

(8) E. C. H. and others.—The construction of a steam whistle will be readily understood from the accompanying engraving. The casting, A, has a stem for supporting the bell, and there is a deep groove around it forming a steam passage. A short piece, B, of brass tubing is fitted and soldered to it, leaving an annular space of about $\frac{1}{100}$ inch between its upper edges and the casting. The bell, C, is of the same diameter as the part, B, and it has a cast head, D, which is screwed on the stem of the casting, A. The steam passages are so clearly indicated in the cut as to require no description. The proportions of the bell may be varied. By lengthening the bell the tone may be made lower.



(9) J. H. P. asks: Can there be sound without a hearer? A. The word sound has two meanings: (*a*) a certain sensation; (*b*) the physical cause of that sensation. In the first sense there would be no sound in the absence of a hearer; in the second sense there would be, for the physical disturbance—sound waves, sonorous vibrations, or what not, would be set agoing.

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(10) H. B. asks if tubes placed inside a wood box with iron ends, and made watertight to prevent leaking, would expand when hot so as to damage the ends and cause leaking? A. If the tubes have considerable length, we think the expansion would cause a leak.

(11) C.H.F. writes: Recently while reading, a common housefly fell on my book, and after spinning around on his back a few times, remained quiet. I then observed a small bright red insect on the fly's body. It disappeared before I could capture it. Is it a fly destroyer? A. It was no doubt one of the mites common to flies.

(12) J. S. B. asks: In your paper of August 18, 1877, you give as "a test for free sulphuric acid in vinegar," methyl aniline violet. Will you state whether liquid aniline violet will detect the sulphuric acid, and if so, in what proportions must the dye and vinegar be? A. As we understand you, yes; dilute the solution with about ten volumes of pure water, and proceed as directed in the note referred to. It is better to make the solution from the dry color—1 part in 2,000 of distilled water.

(13) S. F. & J. S. A. write: 1. We have an iron wire (No. 19) about 3,400 feet in length, connecting two U magnet telephones. The wire passes underneath a telegraph wire, about three feet distant, and at right angles to it. At times we hear a clicking in the telephones of telegraphic signals, and we should like to know if this clicking is occasioned by an induced current of electricity from the telegraphic wire? A. We think so. 2. If so, will our wire be likely to weaken the telegraphic signals? We have a battery of several elements in connection with the wire working a call. A. No.

(14) S. W. asks: How many square feet of condensing surface will I require in a surface condenser to condense the steam running from a one inch pipe from the boiler to the condenser at 60 lbs. pressure to the square inch? A. Allow one square foot of condensing surface for each 10 lbs. of steam to be condensed per hour.

(15) M. J. C. asks if a vacuum that is created in a low pressure engine is a pressure or a suction, or a drawing on the piston? I see 28 or 30 lbs. on the vacuum gauge, and notice that it required 28 or 30 lbs. pressure to bend the spring, so as to indicate it on the dial. A. It is a reduction of the pressure on the piston, the spring or column of mercury being moved by the pressure of the air to balance the decrease of pressure in the interior.

(16) G. M. D. asks: Is there any law that prohibits a person from running a stationary engine and boiler either in country or city, and who is the proper authority to apply to for license? A. In this city it is necessary to obtain a license from the Police Board. The local regulations in different parts of the country vary greatly. In many places no license is required.

(17) H. A. C. asks how to make a sounder for a thread telephone. A. Hang a small bell on a delicate wire spring, and connect the spring with the telephone thread by means of an auxiliary string, so that a slight pull of the telephone thread will make the bell jingle.

(18) W. S. asks: What is the best work for the young engineer and mechanic? A. Rose's "Complete Practical Machinist," and Bourne's "Catechism" and "Hand Book," will be good works with which to make a commencement.

(19) J. B.—The catamaran is not patented, but an improved steering arrangement, and a method of connecting the hulls by flexible joints, have been patented. The patent specifications are published in SUPPLEMENT 105.

(20) J. B. J. asks: 1. How to make a Bell telephone? A. See SCIENTIFIC AMERICAN SUPPLEMENT No. 142, for full directions. 2. Can I sell these telephones without infringing? A. See "Rights of Investigators," p. 128, current volume of SCIENTIFIC AMERICAN.

(21) W. J. D.—Bartol's "Marine Boilers," Burgh's "Treatise on Boilers," and Wilson's "Treatise on Steam Boilers," may answer your purpose.

(22) E. G.M. asks: Can an electro magnetic engine be made powerful enough to propel a boat 20 feet long, 6 feet beam, 5 feet deep? A. Yes; but a steam engine would be far more economical and satisfactory.

(23) J. K. D. writes: I desire some means by which I may be able to measure small intervals of time (say $\frac{1}{10}$ to $\frac{1}{100}$ second). The chronoscope or one of its modifications had suggested itself, but I find it inapplicable. Have electricity at command. A. A tuning fork carrying a straw marking-point, and vibrated so as to cause the point to mark on the smoked surface of a rapidly rotating disk or cylinder, might be used for the purpose, providing an electrical or other device were used to mark the interval across the path of the before mentioned straw.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. W.—The soft stone is an impure and semi-decomposed feldspathic rock. The white soluble exudation consists of alum and iron sulphates. If obtainable in sufficient quantity, of some value.—C. E. B.—No. 1 is a fragment of shale, principally alumina silicate colored by iron oxide and carbonaceous matters. No. 2 is similar to No. 1 in composition. Neither contains graphite.—W. C.—The sample is not genuine attar of roses, although it contains a notable amount of the oil.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

Stove Drum. By J. H. F.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

October 1, 1878,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Alumina, making sulphate of, F. Laur	208,615
Amalgamator, C. P. Bowen	208,509
Augers, manufacture of, W. Tucker	208,651
Axles, straightening car, J. A. Hodel	208,601
Barrel cover, Comly & Brown	208,570
Battery, galvanic, G. Lauder	208,614
Bed bottom, N. T. Hamilton	208,591
Belt fastener, G. L. Zimmer	208,663
Bit brace, E. C. Merryman	208,623
Boiler, locomotive, D. Sullivan	208,546
Boilers, water heater for, J. A. McCormick	208,479
Boot and shoe counter support, W. H. Koopman	208,612
Boot and shoe stiffeners, shaper for, J. R. Moffitt	208,534
Boot and shoe heel trimmer, Van Nouhuys & King	208,653
Bottle stopper, S. Oakman	208,487
Bottle stopper, W. G. Steinmetz	208,647
Bottle stopper cages, mould for, H. Wright	208,662
Box loop, J. Watters	208,550
Box opener, J. H. Giese	208,590
Boxes and trays, making, S. H. Wright	208,661
Brake, steam or air, M. Wood	208,660
Bran, treating, J. T. Shanton	208,642
Brick for annealing furnaces, fire, C. H. Morgan	208,483
Brick maker and presser, J. K. Caldwell	208,566
Bung, W. J. Stevens	208,499
Capsules, cutting of gelatine, F. A. Hubel (r)	8,440
Car coupling L. Brown	208,457
Car, dumping, L. Prince	208,634
Car ventilator window, E. Robinson	208,495
Chain links, bender for, Conway & Heald	208,515
Chair, rocking, A. Morris	208,626
Churn dasher, M. F. Mitchel	208,533
Churn, rotary, J. T. Fry	208,587
Cigar box, M. Jonas	208,604
Clock case, M. Bock	208,563
Clock, illuminated, C. Maynard	208,478
Clutch, H. A. Remington	208,494
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Cooker, food, I. E. Bendickson	208,560
Corset, Birge & Skidmore	208,453
Corset, D. H. Fanning	208,517
Corset clasp, E. J. Love	208,618
Cotton gin saw cleaner, J. C. Drake	208,468
Cultivator, W. H. Dickey	208,576
Doffer comb for carding engines, J. Hibbert	208,598
Door alarm, C. J. Elliott	208,578
Drill attachment, grain, B. Town	208,549
Drill, seed, Hildrup & Tschop	208,599
Drill tooth attachment, S. Frank	208,583
Engine, etc., rotary, Bartrum & Powell	208,559
Engine, rotary, J. Butcher	208,565
Evaporator, F. Michael	208,624
Evaporator, porous, W. Galloway	208,471
Exercising machine, J. G. Nicolay	208,485
Faucet, self-measuring, E. L. Spencer	208,645
Feather renovator, C. G. Barnd	208,558
Feeding stock, device for, O. J. Smith	208,544
Fence wire, barbed, A. L. Pitney	208,538
Fertilizer, C. Richardson	208,540
File, paper, A. Childs	208,568
Filter, water, H. J. Ennis	208,579
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Fish hook, baited, J. Falvey	208,581
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Game table, C. F. A. Reesch	208,539
Gas governor, F. G. Johnson	208,523
Gas, making illuminating, J. Shackleton	208,641
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Glass vessel, incased, D. W. Norris	208,628
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Gold, saving float, J. J. Muller	208,535
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Grader and ditcher, C. C. Skinner	208,497
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Harness, A. Rittenhouse	208,636
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Harvester, R. Campbell	208,461
Hat former, feeder for, P. Starr	208,545
Headlight, locomotive, L. A. Wood	208,553
Heating and ventilating buildings, W. E. Prall	208,633
Hinge, lock, R. Phipps	208,490
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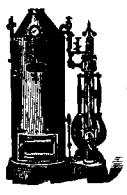

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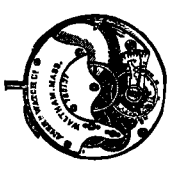

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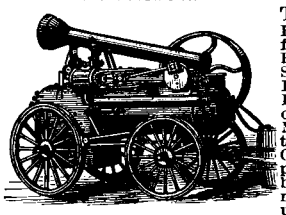

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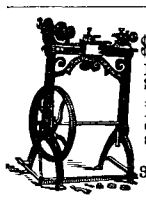

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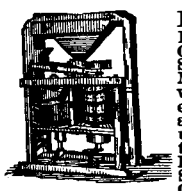

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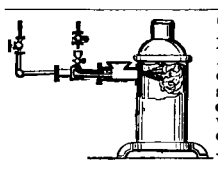

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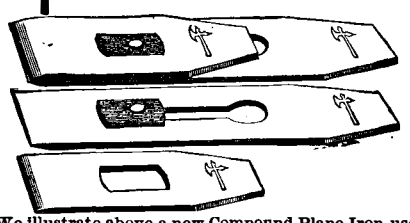

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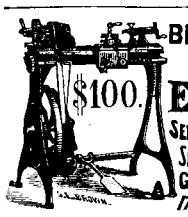

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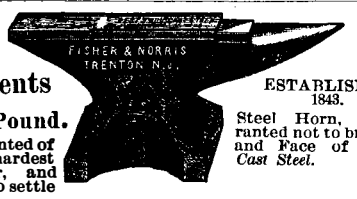

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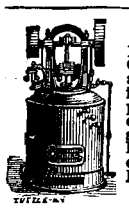

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